SEP 22 1920

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A Journal of British and Foreign Medicine, Surgery, Obstetrics, Physiology, Chemistry, Pharmacology, Public Health, and News.

Telegrams—LANCET, WESTRAND LONDON *Telephone*—GERRARD 5356 *Offices*—423, Strand, London, W.C. 2.

No. X. OF VOL. II., 1920. LONDON, SATURDAY, SEPTEMBER 4, 1920. Pp. 104—Price 1s.
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ON

ANOXÆMIA.

Delivered before the Physiological Section of the British Association for the Advancement of Science

BY JOSEPH BARCROFT, C.B.E., M.A., F.R.S.,

PRESIDENT OF THE SECTION AND SENIOR DEMONSTRATOR IN PHYSIOLOGY, CAMBRIDGE UNIVERSITY.

LADIES AND GENTLEMEN,—The sentence which lives in my mind as embodying the problem of anoxæmia comes from the pen of one who has given more concentrated thought to the subject than perhaps any other worker—Dr. J. S. Haldane.[1] It runs, "Anoxæmia not only stops the machine but wrecks the machinery." This phrase puts the matter so clearly that I shall commence by an inquiry as to the limits within which it is true.

Anything like complete anoxæmia stops the machine with almost incredible rapidity. It is true that the breath can be held for a considerable time, but it must be borne in mind that the lungs have a volume of about three litres at any moment, that they normally contain about half a litre of oxygen, and that this will suffice for the body at rest for upwards of two minutes. But get rid of the residual oxygen from the lungs only to the very imperfect extent which is possible by the breathing of some neutral gas, such as nitrogen, and you will find that only with difficulty will you endure half a minute. Yet even such a test gives no real picture of the impotence of the machine—which is the brain—to "carry on" in the absence of oxygen. For, on the one hand, nearly a quarter of a minute elapses before the reduced blood gets to the capillary in the brain, so that the machine has only carried on for the remaining quarter of a minute; on the other hand, the arterial blood under such circumstances is far from being completely reduced—in fact, it has very much the composition of ordinary venous blood, which means that it contains about half its usual quota of oxygen. It seems doubtful whether complete absence of oxygen would not bring the brain to an instantaneous standstill. So convincing are the experimental facts to anyone who has tested them for himself that I will not further labour the power of anoxæmia to stop the machine. I will, however, say a word about the assumption which I have made that the machine in this connexion is the brain.

It cannot be stated too clearly that anoxæmia in the last resort must affect every organ of the body directly. Stoppage of the oxygen supply is known, for instance, to bring the perfused heart to a standstill, to cause a cessation of the flow of urine, to produce muscular fatigue, and at last immobility, but from our present standpoint these effects of anoxæmia seem to me to be out of the picture, because the brain is so much the most sensitive to oxygen-want. Therefore, if the problem is the stoppage of the machine due to an insufficient general supply of oxygen, I have little doubt that the machine stops because the brain stops, and here at once I am faced with the question how far is this assumption and how far is it proven fact? I freely answer that research in this field is urgent; at present there is too great an element of assumption, but there is also a certain amount of fact.

ACUTE ANOXÆMIA.

To what extent does acute anoxæmia in a healthy subject wreck the machinery as well as stop the machine? By acute anoxæmia I mean complete or almost complete deprivation of oxygen which, in the matter of time, is too short to prove fatal. It is not easy to obtain quite clear-cut experiments in answer to the above question. No doubt many data might be quoted of men who have recovered from drowning, &c. Such data are complicated by the fact that anoxæmia has only been a factor in their condition; other factors, such as accumulation of carbonic acid, may also have contributed to it. The remarkable fact about most of them, however, is the slightness of the injury which the machine has suffered. These data, therefore, have a value in so far as they show that a very great degree of anoxæmia, if acute and of short duration, may be experienced with but little wreckage to the machine. They have but little value in showing that such wreckage is due to the anoxæmia, because the anoxæmia has not been the sole disturbance. Of such cases I will quote two.

The first is that of a pupil of my own who received a gunshot wound in the head, to the prejudice of his cerebral circulation. I can give you the most perfect assurance that neither intellectually nor physically has the catastrophe which befell him caused any permanent injury. For the notes of the case I am indebted to Colonel Sir William Hale White.

> My pupil fell wounded at 6.50 A.M. on Nov. 20th, 1917. As far as is known, he lay insensible for about two hours. Picked up five hours after the wound, he could not move either upper or lower extremity. Thirty-six hours after the wound he underwent an operation, which showed that the superior sagittal sinus was blocked, happily not by a thrombus, but by being torn and having pieces of the inner table of the skull thrust into it, so that for this period of time the motor areas on both sides down to the face area were asphyxiated, the right being much more affected than the left. Six days after the wound the cerebration was still slow, with typically vacant look.
>
> In the left upper extremity the muscular power was much improved; he could raise his arm to his mouth, but he preferred to be fed. In the right upper extremity there were no movements in the shoulder, elbow, or wrist, but he could flex and extend the fingers weakly. In the left lower extremity there were fair movements of hip and knee; no movements of ankle and toes. In the right lower extremity there were no movements of hip, knee, ankle, or toes.
>
> Six weeks after the wound he first walked, although with difficulty; absolutely the last place in which the paresis remained was in the muscles of the right toes. Four months after the injury these toes were spread out and could not be brought together voluntarily. Gradually this has become less, but even now, two and a half years later, all these muscles are weaker than those on the other side.

Such, then, is the wreckage of the machine caused by 36 hours' blockage of the blood flow through the motor areas of the brain; wreckage enough, but not irreparable.

I pass to the second case. It is that of the child of a well-known professor of physiology and a first authority on the subject of respiration. I am indebted to him for the following notes:—

> In this child, a male twin, born about 12 weeks too early, it was noticed about 24 hours after birth that the breathing during sleep was irregular and of a very pronounced Cheyne-Stokes type, six to ten breaths being followed by a pause during which no respiratory movement occurred. Usually the pauses were of 15 to 20 seconds' duration, but occasionally (two to ten times a day) the breathing remained suspended for a prolonged period, extending in some cases to 10 and 15 minutes, and in one accurately observed case even to 25 minutes, interrupted by one single breath and a cry about the middle of the period. The breathing invariably started again before the heart beats ceased.

Cases in which the anoxæmia has been uncomplicated are to be found among those who have been exposed to low atmospheric pressures; for instance, balloonists and aviators. Of these quite a considerable number have suffered from oxygen-want to the extent of being unconscious for short intervals of time. No scientfic observer has pushed a general condition of anoxæmia either on himself or on his fellows to the extent of complete unconsciousness. The most severe experiments of this nature are those carried out by Haldane and his colleague. One experiment in particular demands attention.

> Dr. Haldane and Dr. Kellas[2] together spent an hour in a chamber in which the air was reduced to between 320 and 295 mm. It is difficult to say how far they were conscious. Clearly each believed the other to be complete master of his own faculties, but it is evident that Dr. Haldane was not so. I gather that he has no recollection of what took place; that whenever he was consulted about the pressure he gave a stereotyped answer which was the same for all questions; that, even with a little more oxygen present, he was sufficiently himself to wish to investigate the colour of his lips in the glass, but insufficiently himself to be conscious that he was looking into the back and not the front of the mirror. Dr. Kellas, who could make observations, never discovered Dr. Haldane's mental condition, though boxed up with him for an hour, and went on consulting him automatically. A somewhat similar experiment was performed on the other two observers, with results differing only in degree.
>
> Yet the after-effects are summed up in the following sentence: "All four observers suffered somewhat from headache for several hours after these experiments, but there was no nausea or loss of appetite."

Of real importance in this connexion are the results of carbon monoxide poisoning. Of these a large number

might be cited. Those interested will find some very instructive cases described in a volume entitled "The Investigation of Mine Air," by the late Sir C. Le Neve Foster and Dr. Haldane.[3] The cases in question were those of a number of officials who went to investigate the mine disaster on Snaefell, in the Isle of Man, in May, 1897. Of the five cases cited all suffered some after-effects, by which I mean that by the time the blood was restored sufficiently to its normal condition for the tissues to get the amount of oxygen which they required, the effects of the asphyxia had not passed off and to this extent the machine suffered.

To sum up, then, what may be said of the permanent damage caused by acute anoxæmia, it seems to me to be as follows: No degree of anoxæmia which produces a less effect than that of complete unconsciousness leaves anything more than the most transient effects; if the anoxæmia be pushed to the point at which the subject is within a measurable distance of death the results may take days or weeks to get over, but only in the case of elderly or unsound persons is the machine wrecked beyond repair.

CHRONIC ANOXÆMIA.

And now to pass to the consideration of what I may call chronic anoxæmia—that is to say, oxygen-want which perhaps is not very great in amount—and I shall have to say something later about the measurement of anoxæmia in units, but which is continued over a long time—weeks, months, or perhaps years. We have to ask ourselves, how far does chronic anoxæmia stop the machinery; how far does it wreck the machine? Here we are faced with a much more difficult problem, for the distinction between stopping the machinery and wrecking the machine tends to disappear. In fact, so indistinct does it become that you may ask yourself, with some degree of justice, does chronic anoxæmia stop the machine in any other way than by wrecking it?

The most obvious instances of men subject to chronic anoxæmia are the dwellers at high altitudes. Now, it is quite clear that in many instances of mountain-dwellers the anoxæmia does not wreck the machine. On what I may call the average healthy man anoxæmia begins to tell at about 18,000 feet. At lower altitudes no doubt he will have some passing trouble, but it seems to me from my own experience that this altitude is a very critical one. Yet there are mining camps at such heights in South America at which the work of life is carried on. Under such circumstances the machine is kept going by a process of compensation. This is in part carried out by a modification in the chemical properties of the blood. It would appear that both the carbonic acid in the blood and the alkali diminish. The result, according to my interpretation of my own observations on the Peak of Teneriffe, which appeared to be confirmed by the experiments in a chamber in Copenhagen[4] from which the air was partially exhausted, was this: the hydrogen-ion concentration of the blood increased slightly, the respiratory centre worked more actively, and the lung became better ventilated with oxygen, with the natural result that the blood became more oxygenated than it would otherwise have been. The difference which this degree of acclimatisation made was very great. Take as an example one of my colleagues, Dr. Roberts.

On Monte Rosa in his case, as in that of the rest of the party, 15 mm. of oxygen pressure were gained in the lungs. To put the matter another way, the amount of oxygen in our lungs at the summit was what it would otherwise have been 5000 or 6000 feet lower down. No actual analyses of the oxygen in Roberts's arterial blood were made, but from what we now know it seems probable that his blood was about 82 per cent. saturated—that is to say, that for every 100 g. of hæmoglobin in the blood 82 were oxyhæmoglobin and 18 reduced hæmoglobin; had this degree of acclimatisation not taken place his blood would have contained as many as 38 parts of unoxidised hæmoglobin out of every 100, and this would probably have made all the difference between the machine stopping and going on.

The body, then, had fought the anoxæmia and reduced it very much in degree, but at the same time the anoxæmia had in a subtle way done much to stop the powers of the body, for this very acclimatisation is effected at the expense of the ultimate reserve which the body has at its disposal for the purpose of carrying out muscular or other work. The oxygen in the lungs was obtained essentially by breathing at rest as you would normally do when taking some exercise. Clearly, then, if you are partly out of breath before you commence exercise you cannot undertake so much as you otherwise would do. As a friend of mine, who has, I believe, camped at a higher altitude than any other man, put it to me, "So great was the effort that we thought twice before we turned over in bed."

One of the interesting problems with regard to chronic anoxæmia is its effect upon the mind. The whole train of symptoms of CO poisoning strongly suggests some form of intoxication, and is not dissimilar to that produced by alcoholic excess. Here it may be noted that, as far as isolated nerves are concerned, there is pretty good evidence that alcohol and want of oxygen produce exactly the same effects—i.e., they cause a decrement in the conducting power of the nerve. And herein lies a part of its interest, for pharmacologists of one school, at all events, tell me that the corresponding effects of alcohol are really due to an inhibition of the higher centres of the mind; you can therefore conceive of the mental mechanism of self-control being knocked out either because it has not oxygen enough with which to "carry on," or because it is drugged by some poison as a secondary result of the anoxæmia.

Turning to the results of more chronic anoxæmia. If I were to try to summarise them in a sentence I should say that, just as acute anoxæmia simulates drunkenness, chronic anoxæmia simulates fatigue. Another symptom frequently associated with mental fatigue is irritability. Anyone who has experience of high altitudes knows to his cost that life does not run smoothly at 10,000 feet. If the trouble is not with one's own temper it is with those of one's colleagues; and so it was in many cases of gas-poisoning and in the case of aviators.

TYPES OF ANOXÆMIA.

And now to pass to the consideration of the various types of anoxæmia. Anoxæmia is by derivation want of oxygen in the blood. Suppose you allow your mind to pass to some much more homely substance than oxygen—such, for instance, as milk—and consider the causes which may conspire to deprive your family of milk, three obvious sources of milk deficiency will occur to you at once: (1) There is not enough milk at the dairy; (2) the milk is watered or otherwise adulterated so that the fluid on sale is not really all milk; and (3) the milkman from that particular dairy does not come down your road. These three sources of milk deficiency are typical of the types of oxygen deficiency.

The first is insufficient oxygen dispensed to the blood by the lungs. An example of this type of anoxæmia is mountain-sickness. The characteristic of it is insufficient *pressure* of oxygen in the blood. In mountain-sickness the insufficiency of pressure in the blood is due to insufficient pressure in the air, for, according to our view at all events, the pressure in the blood will always be less than that in air. But this type of anoxæmia may be due to other causes. The sufferer may be in a normal atmosphere, yet for one reason or another the air may not have access to his whole lung. In such cases, either caused by obstruction, by shallow respiration, or by the presence of fluid in the alveoli, the blood leaving the affected areas will contain considerable quantities of reduced hæmoglobin. This will mix with blood from unaffected areas which is about 95 per cent. saturated. The oxygen will then be shared round equally among the corpuscles of the mixed blood, and if the resultant is only 85–90 per cent. saturated the pressure of oxygen will only be about half the normal, and, as I said, deficiency of oxygen pressure is the characteristic of this type of anoxæmia.

The second type involves no want of oxygen pressure in the arterial blood; it is comparable to the watered milk; the deficiency is really in the quality of the blood and not in the quantity of oxygen to which the blood has access. The most obvious example is anæmia, in which from one cause or other the blood contains too low a percentage of hæmoglobin, and because there is too little hæmoglobin to carry the oxygen too little oxygen is carried. Anæmia is, however, only one example which might be given of this type of anoxæmia. There may be sufficient hæmoglobin in the blood, but the hæmoglobin may be useless for the purpose of oxygen transport; it may be turned in part into methæmoglobin, as in several diseases—e.g., among workers in the manufacture of some chemicals, and in some forms of dysentery contracted in tropical climates, or it may be monopolised by carbon monoxide, as in mine air.

Thirdly, the blood may have access to sufficient oxygen and may contain sufficient functional hæmoglobin, but owing to transport trouble it may not be circulated in sufficient quantities to the tissues. The quantity of oxygen which reaches the tissue in unit time is too small. Literally, according to the strict derivation of the word "anoxæmia," the third type should perhaps be excluded from the category of conditions covered by that word, but, as the result is oxygen starvation in the tissues, it will be convenient to include it. Indeed, it would be an act of pedantry not to do so, for no form of anoxæmia has any significance apart from the fact that it prevents the tissues from obtaining the supply of oxygen requisite for their metabolic processes.

The obvious types of anoxæmia may therefore be classified in some such scheme as the following, and, as it is difficult to continue the discussion of them without some sort of nomenclature, I am giving a name to each type:—

ANOXÆMIA.

1. *Anoxic Type.*	2. *Anæmic Type.*	3. *Stagnant Type.*
The pressure of oxygen in the blood is too low. The hæmoglobin is not saturated to the normal extent. The blood is dark. Examples: (1) Rare atmospheres; (2) areas of lung partially unventilated; (3) fluid or fibrin on surface of cells.	The quantity of functional hæmoglobin is too small. The oxygen pressure is normal. The blood is normal in colour. Examples: (1) Too little hæmoglobin; (2) CO hæmoglobin; (3) methæmoglobin.	The blood is normal, but is supplied to the tissues in insufficient quantities. Examples: (1) Secondary result of histamine shock; (2) hæmorrhage; (3) back pressure.

Anoxic anoxæmia is essentially a general as opposed to a local condition. Not only is the pressure of oxygen in the blood too low, but the lowness of the pressure and not the deficiency in the quantity is the cause of the symptoms observed. Proof of the above statement is to be found in the researches of most workers who have carried out investigations at low oxygen pressures, and it can now be brought forward in a much more convincing way than formerly that oxygen secretion is, for the time at all events, not a factor to be counted with.

The workers on Pike's Peak, for instance, emphasised the fact that the increase of red blood corpuscles during their residence at 14,000 feet was due to deficient oxygen pressure. No doubt they were right, but the point was rather taken from their argument by their assertion in another part of the paper that the oxygen pressure in their arterial blood was anything up to about 100 mm. of mercury. Let me therefore take my own case, in which the alveolar pressures are known to be an index of the oxygen pressures in the arterial blood. I will compare my condition on two occasions, the point being that on these two occasions the quantities of oxygen united with the hæmoglobin were as nearly as may be the same, whilst the pressures were widely different. As I sit here the hæmoglobin value of my blood is 96–97, which corresponds to an oxygen capacity of 0·178 c.cm. of O_2 per cubic centimetre of blood. In the oxygen chamber on the last day of my experiment, to which I refer later,[5] the oxygen capacity of my blood was 0·201 c.cm. Assuming the blood to be 95 per cent. saturated now and 84 per cent. saturated then, the actual quantity of oxygen in the blood on the two occasions would be—

Oxygen capacity.		Percentage saturation.		Oxygen content.
0·178	.....	95	.....	0·169
0·201	.....	84	.....	0·169

Here I am in my usual health. In the chamber I vomited, my pulse was 86—it is now 56; my head ached in a most distressing fashion, it was with the utmost difficulty that I could carry out routine gas analyses, and when doing so the only objects which I saw distinctly were those on which my attention was concentrated.

In the anoxic type of anoxæmia there may then be quite a sufficient quantity of oxygen in the blood, but a sufficient quantity does not avail in the face of an insufficient pressure. Indeed, as I shall show presently, the anoxic type of anoxæmia is the most serious. We are therefore confronted with something of a paradox in that the most severe type of anoxæmia is one in which there is not necessarily an insufficient quantity of oxygen in the blood at all. And here let me justify the statement that the anoxic type is the most to be feared. I can justify it on either or both of two grounds. Firstly, of the three types it places the tissues at the greatest disadvantage as regards oxygen supply, and, secondly, it is of the three the least easy type for the organism to circumvent.

Let me dwell for a moment upon the efficiency of the blood as a medium for the supply of oxygen to the tissue in the three types. The goal of respiration is to produce and maintain as high an oxygen pressure in the tissue fluids as possible. For the velocity of any particular oxidation in the tissues must depend upon the products of the concentrations (active masses) of the material to be oxidised and of the oxygen. Now the concentration of oxygen in the tissue is proportional to its partial pressure, and the highest partial pressure in the tissue must, other things being equal, be the result of that type of anoxæmia in which there is the highest partial pressure in the blood plasma.

It is interesting and not uninstructive to try to calculate the degree to which the tissues are prejudiced by being subjected to various types of anoxæmia. Let us suppose that we have a piece of tissue, muscle for instance, which normally is under the following conditions: (*a*) One cubic centimetre of blood per minute runs through it. (*b*) The total oxygen capacity of this blood is 0·188 c.cm. of oxygen per cubic centimetre of blood. (*c*) The percentage saturation is 97. (*d*) The oxygen pressure is 100 mm. (*e*) The oxygen used is 0·059 c.cm. (*f*) The oxygen pressure in the tissues is half of that in the veins, in this case 19 mm.

Compare with this a severe case of anoxic anoxæmia, one in which the blood flow is the same as above, and also the oxygen capacity value of the blood, but in which the oxygen pressure is only 31 mm. and the percentage saturation of the arterial blood 66 per cent. Let us, further, retain the assumption that the oxygen pressure in the tissues is half that in the veins. It is possible to calculate, as indeed has been done by my colleague, Mr. Roughton, what the amount of oxygen leaving the capillaries is. The answer is not 0·059, as in the case of the normal, but 0·026—less than half the normal. So, other things being equal, cutting down the oxygen pressure in the arterial blood to 31 and the percentage saturation to 66 would deprive the tissues of half their oxygen. With this compare an example of the anæmic type. The arterial blood shall have the same total quantity of oxygen as in the anoxic case, but instead of being 66 per cent. saturated it shall contain 66 per cent. of the total hæmoglobin, which shall be normally saturated. The amount of oxygen which would pass to the tissues under these conditions is 0·041 c.cm.—more than half as much again as from the anoxic blood laden with the same quantity of oxygen.

And thirdly, let us take for comparison a case of stagnant anoxæmia in which the same quantity of oxygen goes to the tissue in the cubic centimetre of blood as in the anoxic and anæmic types. On the assumption which we have made the quantity of oxygen which would leave the blood would be 0·045 c.cm.

In round numbers, therefore, the prejudice to the tissues may be expressed by the following comparison. In this case both of the oxygen going to the blood and going into the tissues I have called the normal 100. This does not, of course, mean that the two amounts are the same. The former in absolute units is about three times the latter. The figure 100 at the top of each column is merely a standard with which to compare the figures beneath it.

		Oxygen in blood going to vessels of tissue.	Oxygen leaving the blood to supply the tissues.
Normal		100 per cent.	100 per cent.
Anoxæmia	Anoxic	66 ,,	42 ,,
	Anæmic	66 ,,	66 ,,
	Stagnant	66 ,,	75 ,,

MEASUREMENT OF ANOXÆMIA.

By what scale are we to measure oxygen-want? Let us take the anoxic type first. There are two scales which might be applied to it; both concern the arterial blood; the one is the oxygen pressure in it, the other is the actual percentage of the hæmoglobin which is oxyhæmoglobin. A third possibility suggests itself—namely, the actual amount of oxygen present, but this would be influenced as much by the anæmic as by the anoxic conditions. Of the two possibilities—that of measuring the pressure, and that of measuring the saturation of the blood with oxygen—the latter is the one which is likely to come into vogue, because it is susceptible of direct measurement.

Two converging lines of work have within the last few years brought us nearer to being able to state the degree of anoxæmia in man in terms of the percentage

saturation of oxygen in his blood. The first, introduced by the American researcher Stadie,[6] is the method of arterial puncture. The needle of a hypodermic syringe can be put right into the radial artery and arterial blood withdrawn. I am not sure that the operation is less painful than that of dissecting out the radial artery and opening it—and in this matter I speak with experience—but it is less alarming, and it has the great merit that it does not injure the artery.

Another method of determining the percentage saturation of arterial blood has invited the attention of researchers. That method is to deduce the percentage saturation from the composition of the alveolar air. Into the merits of the rival methods for the determination of the oxygen in alveolar air I will not go; the method of Haldane and Priestley will suffice for persons at rest. Granted, then, that a subject has a partial pressure of 50 mm. of oxygen in his alveolar air, what can we infer as regards his arterial blood? A long controversy has raged about whether or no any assumption could be made about the condition of the arterial blood from that of the alveolar air, for it was an article of faith with the school of physiologists which was led by Haldane that when the oxygen pressure in the alveolar air sank the oxygen in the arterial blood did not suffer a corresponding reduction. The experimental evidence at present points in the opposite direction, and unless some further facts are brought to light it may be assumed that the oxygen pressure in the arterial blood of a normal person at rest is some 5 mm. below that in his alveolar air. And having obtained a figure for the pressure of oxygen in the arterial blood, where do we stand as regards the percentage saturation? The relation between the one and the other is known as the oxygen dissociation curve. It differs but slightly in normal individuals, and at different times in the same individual. To infer the percentage saturation from the oxygen pressure no doubt the actual dissociation curve should be determined, but in practice it is doubtful whether as a first approximation this is necessary, for a curve determined as the result of a few observations is unlikely to be much nearer the mark than a standard curve on which 20 or 30 points have been determined. Therefore an approximation can be made for the percentage saturation as follows: In a normal individual take the oxygen in the alveolar air, subtract 5 mm., and lay the result off on the mean dissociation curve for man.

Whether measured directly or indirectly, the answer is a statement of the relative quantities of oxyhæmoglobin and of reduced hæmoglobin in the arterial blood. The important thing is that there should be as little reduced hæmoglobin as possible. The more reduced hæmoglobin there is present the less saturated is the blood, or, as the American authors say, the more *un*saturated is the blood. They emphasise the fact that it is the quantity of reduced hæmoglobin that is the index of the anoxic condition. They speak not of the percentage saturation, but of the percentage of unsaturation. A blood which would ordinarily be called 85 per cent. saturated they speak of as 15 per cent. unsaturated.

Anoxic anoxæmia, in many cases of lung affection, should be measured by the direct method of arterial puncture, for the simple reason that the relation between the alveolar air and the arterial blood is quite unknown. Such, for instance, are cases of many lung lesions of pneumonia in which the lung may be functioning only in parts, of pneumothorax, of pleural effusions, of emphysema, of multiple pulmonary embolism, in phases of which the arterial blood has been found experimentally to be unsaturated. In addition to these definite lung lesions, there is another type of case on which great stress has been laid by Haldane, Meakins, and Priestley—namely, cases of shallow respiration.[7] A thorough investigation of the arterial blood in such cases is urgently necessary. Indeed, in all cases in which it is practicable, the method of arterial puncture is desirable. But in the case of many normal persons—such, for instance, as that of airmen at different altitudes—alveolar-air determinations would give a useful index.

The anæmic type of anoxæmia is gauged by the quantity of oxyhæmoglobin in the blood. In the case of simple anæmias this is measured by the scale in which the normal man counts as 100, and the hæmoglobin in the anæmic individual is expressed as a percentage of this. This method has been standardised carefully by Haldane, and we now know that the man who shows 100 on the scale has an oxygen capacity of 0·185 c.cm. of oxygen for every cubic centimetre of blood. We can, therefore, in cases of carboxyhæmoglobin, or methæmoglobin poisoning, express the absolute amount of oxyhæmoglobin pressure either by stating the oxygen capacity and so getting an absolute measurement, or in relative units by dividing one hundred times the oxygen capacity by 0·185, and thus getting a figure on the ordinary hæmoglobin metre scale.

MECHANISM OF ANOXÆMIA.

Perhaps the most difficult phase of the discussion is that of how anoxæmia produces its baneful results. In approaching this part of the subject I should like to warn my readers of one general principle, the neglect of which seems to be responsible for a vast dissipation of energy. Before you discuss whether a certain effect is due to cause A or cause B, be clear in your own mind that A and B are mutually exclusive.

Let me take an example and suppose

(1) That the energy of muscular contraction in the long run depends in some way on the oxidation of sugar;

(2) That in the absence of an adequate supply of oxygen, the reaction $C_6H_{12}O_6 + 6O_2 = 6CO_2 + 6H_2O$ cannot take place in its entirety;

(3) That under such circumstances some lactic acid is formed as well as carbonic acid;

(4) That the hydrogen-ion concentration of the blood rises and the total ventilation increases. On what lines are you to discuss whether the increased ventilation is due to "acidosis," by which is meant in this connexion the increased hydrogen-ion concentration of the blood, or to "anoxæmia"? Clearly not on the lines that it must be due to one or other.

In the above instance anoxæmia and acidosis are, to some extent, dependent variables. I have chosen the above case because measurements have been made throughout which make the various assumptions fairly certain, and tell us pretty clearly in what sort of chain to string up the events, what is cause and what is effect. Clearly it would be ridiculous to start a discussion as to whether the breathlessness was due to "acidosis" or "anoxæmia." Each has its place in the chain of events. But I have heard discussions of whether other phenomena of a more obscure nature were due to oxygen-want or to acidosis. Such discussions tend to no useful end.

Nor is this the only problem with regard to oxygen-want, concerning which my warning is needed. Oxygen-want may act immediately in at least two ways:—

(1) In virtue of absence of oxygen some oxidation which otherwise might take place does not do so, and therefore something which might otherwise happen may not happen. For instance, it may be conceived that the respiratory centre can only go through the rhythmic changes of its activity as the result of the oxidation of its own substance.

(2) A deficient supply of oxygen may produce, not the negation of a chemical action, but an altered chemical action which in its turn produces toxic products that have a secondary effect on such an organism as the respiratory centre.

Now these effects are not mutually exclusive. In the same category are many arguments about whether accumulations of carbonic acid act specifically as such or merely produce an effect in virtue of their effect on the hydrogen-ion concentration. Here, again, the two points of view are not, strictly speaking, alternatives, and, in some cases at all events, both actions seem to go on at the same time.

It will be evident that in any balanced action in which CO_2 is produced its accumulation will tend to slow the reaction; but, on the other hand, the same accumulation may very likely raise the hydrogen-ion concentration, and in that way produce an effect.

The relation of oxygen to hæmoglobin seems to furnish a case in point. Carbonic acid is known to reduce the affinity of hæmoglobin for oxygen, and other acids do the same. On analogy, therefore, it might have, and has, been plausibly argued that CO_2 acts in virtue of the change in reaction which it produces. Put into mathematical language, the relation of the percentage saturation of oxygen to the oxygen pressure of the gas dissolved in the hæmoglobin solution is expressed by the equation

$$\frac{y}{100} = \frac{Kx^n}{1 + Kx^n} = \frac{x^n}{L + x^n}$$

where $L = 1/K$, where y is the percentage saturation and x the oxygen pressure. The value of K is the measure of the affinity of oxygen for hæmoglobin; the

less the value of K the less readily do the two substances unite.

Now 1/K has been shown by Laurence J. Henderson,[8] and independently by Adair, to vary directly with the concentration of CO_2. The value of this constant is, according to Henderson, too great to be a direct effect of the CO_2 on the hæmoglobin, and involves as well the assumption that the hæmoglobin in blood is in four forms—an acid and a salt of reduced hæmoglobin and an acid and a salt of oxyhæmoglobin. The presence of CO_2 alters the balance of these four substances.

It is rather fashionable at present to say that "the whole question of acidosis and anoxæmia is in a hopeless muddle." The "muddle," in so far as it exists, is not, I think, by any means hopeless; but I grant freely enough that we are rather at the commencement than at the end of the subject, that much thought and much research must be given, firstly, in getting accurate data, and, secondly, on relating cause and effect, before the whole subject will seem simple. No effort should be spared to replace indirect by direct measurements. My own inference with regard to changes of the reaction of the blood, based on interpretations of the dissociation curve, should be checked by actual hydrogen-ion measurements, as has been done by Hasselbach and is being done by Donegan and Parsons.[9] Meakins also is, I think, doing great work by actually testing the assumptions made by Haldane and himself as regards the oxygen in arterial blood.

COMPENSATIONS FOR ANOXÆMIA.

For the anoxic type of anoxæmia two forms of compensation at once suggest themselves. The one is increased hæmoglobin in the blood; the other is increased blood flow through the tissues. To go back to the extreme anoxic case already cited, in which the hæmoglobin was 66 per cent. saturated, let us, firstly, see what can be accomplished by an increase of the hæmoglobin value of the blood. Such an increase takes place, of course, at high altitudes. Let us suppose that the increase is on the same grand scale as the anoxæmia, and that it is sufficient to restore the actual quantity of oxygen in 1 c.cm. of blood to the normal. This, of course, means a rise in the hæmoglobin value of the blood from 100 to 150 on the Gowers's scale. Yet even so great an increase in the hæmoglobin will only increase the oxygen taken up in the capillary from each c.cm. of blood from 0·031 to 0·036 c.cm., and will therefore leave it far short of the 0·06 c.cm. which every cubic centimetre of normal blood was giving to the tissue. So much, then, for increased hæmoglobin. It gives a little, but only a little, respite. Let us turn, therefore, to increased blood flow.

In the stagnant type of anoxæmia the principal change which is seen to take place is an increase in the quantity of hæmoglobin per cubic millimetre of blood.

This increase is secondary to a loss of water in the tissues, the result in some cases, as appears from the work of Dale, Richards, and Laidlaw,[10] of a formation of histamine in the tissues. But, so far as the evidence available at the present time can teach any lesson, that lesson is this: The only way of dealing satisfactorily with the anoxic type of anoxæmia is to abolish it by in some way supplying the blood with oxygen at a pressure sufficient to saturate it to the normal level.

It has been maintained strenuously by the Oxford school of physiologists that Nature actually did this; that when the partial pressure in the air-cells of the lung was low the cellular covering of that organ could clutch at the oxygen and force it into the blood at an unnatural pressure, creating a sort of forced draught. This theory, as a theory, has much to recommend it. I am sorry to say, however, that I cannot agree with it on the present evidence. I will only make a passing allusion to the experiment which I performed in order to test the theory, living for six days in a glass respiration chamber in which the partial pressure of oxygen was gradually reduced until it was at its lowest—about 45 mm. Such a pressure, if the lung was incapable of creating what I have termed a forced draught, would mean an oxygen pressure of 38–40 mm. of mercury in the blood, a change sufficient to make the arterial blood quite dark in colour, whereas, did any considerable forced draught exist, the blood in the arteries would be quite bright in colour. Could we but see the blood in the arteries, its appearance alone would almost give the answer as to whether or no oxygen was forced, or, in technical language, secreted, through the lung wall. And, of course, we could see the blood in the arteries by the simple process of cutting one of them open and shedding a little into a closed glass tube. To the surgeon this is not a difficult matter, and it was, of course, done. The event showed that the blood was dark, and the most careful analyses failed to discover any evidence that the body can force oxygen into the blood in order to compensate for a deficiency of that gas in the air.

Yet the body is not quite powerless. It can, by breathing more deeply, by increasing the ventilation of the lungs, bring the pressure of oxygen in the air-cells closer to that in the atmosphere breathed than would otherwise be the case. I said just now that the oxygen in my lungs dropped to a minimal pressure of 45 mm.; but it did not remain at that level. When I bestirred myself a little it rose, as the result of increased ventilation of the lung, to 56 mm., and at one time, when I was breathing through valves, it reached 68 mm. Nature will do something, but what Nature does not do should be done by artifice. Exploration of the condition of the arterial blood is only in its infancy, yet many cases have been recorded in which in illness the arterial blood has lacked oxygen as much as or more than my own did in the respiration chamber when I was lying on the last day, with occasional vomiting, racked with headache, and at times able to see clearly only as an effort of concentration. A sick man, if his blood is as anoxic as mine was, cannot be expected to fare better as the result, and so he may be expected to have all my troubles in addition to the graver ones which are, perhaps, attributable to some toxic cause. Can he be spared the anoxæmia? The result of our calculations, so far, points to the fact that the efficient way of combating the anoxic condition is to give oxygen. During the war it was given with success in the field in cases of gas-poisoning, and also special wards were formed on a small scale in this country in which the level of oxygen in the atmosphere was kept up to about 40 per cent., with great benefit to a large percentage of the cases. The practice then inaugurated is being tested at Guy's Hospital by Dr. Hunt, who administered the treatment during the war.

Nor are the advantages of oxygen respiration confined to pathological cases. One of the most direct victims of anoxic anoxæmia is the airman who flies at great heights. Everything in this paper tends to show that to counteract the loss of oxygen which he sustains at high altitudes there is but one policy—namely, to provide him with an oxygen equipment which is at once as light and as efficient as possible—a consummation for which Haldane has striven unremittingly. And here I come to the personal note on which I should like to conclude. In the pages which I have read views have been expressed which differ from those which he holds in matters of detail—perhaps in matters of important detail. But Haldane's teaching transcends mere detail. He has always taught that the physiology of to-day is the medicine of to-morrow. The more gladly, therefore, do I take this opportunity of saying how much I owe, and how much I think medicine owes and will owe, to the inspiration of Haldane's teaching.

References.

1. Haldane.
2. Haldane, Kellas, and Kennaway: Journal of Physiology, liii.
3. Foster and Haldane: The Investigation of Mine Air, Griffin and Co., 1905. Reviewed at length in THE LANCET, June 10th, 1905, and the individual experiences recorded in detail.
4. Krogh and Lindhard: Quoted by Bainbridge.
5. Barcroft, Cooke, Hartridge, Parsons, and Parsons: Journal of Physiology, liii., p. 451, 1920.
6. Stadie: Journal of Experimental Medicine, xxx., p. 215, 1919.
7. Haldane, Meakins, and Priestley: Journal of Physiology, lii., p. 420, 1918-19.
8. L. J. Henderson: The Journal of Biological Chemistry, vol. xli., p. 401, 1920.
9. Donegan and Parsons: Journal of Physiology, lii., p. 315, 1912.
10. Dale and Richards: Journal of Physiology, lii., p. 110, 1919. Dale and Laidlaw: Ibid., p. 355.

ON THE

INVESTIGATION OF GASTRIC FUNCTION

BY MEANS OF THE FRACTIONAL TEST-MEAL.[1]

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IN 1914 Rehfuss described a method of obtaining a continued record of the digestive functions of the stomach with the aid of a small-bore rubber tube, having attached to its lower extremity a perforated metal bulb, through which samples of a test-meal were withdrawn at intervals until the stomach was found to be empty. Analyses of the free hydrochloric and total acidity were made on the samples withdrawn and the results were plotted as a curve. The method has many obvious advantages over the old one-hour test-meal.

Together with his co-workers—Hawk, Fowler, Bergeim, and Clarke—Rehfuss published several accounts of the findings obtained both in healthy subjects and in sufferers from various gastric disturbances. Crohn and Reiss have also published observations mainly on hospital patients and having particular reference to the action of acid, antacid, and other drugs on the secretory cycle.

For some reason, however, the fractional method of gastric analysis does not appear to have been widely adopted in this country.

At the beginning of the present year the writer started to review the method both as a means of studying normal gastric physiology and as an aid to clinical diagnosis. Investigations on an extended scale are now in progress, but the results up to date have been so instructive that it seemed desirable to publish a brief account of the method and to forecast some of its possible applications, if only with a view to obtaining for it a wider recognition and trial. With the aid of a Rehfuss's or Einhorn's tube it has become possible to repeat on the healthy human subject a number of the historical animal experiments of Pavlov, and under circumstances far less troublesome and abnormal, while in clinical inquiries the information obtained may be so abundant that, in comparison, the worth of the one-hour test would appear to be greatly diminished. The writer has been able to confirm many of the findings of Rehfuss and to add a few additional observations to those already on record.

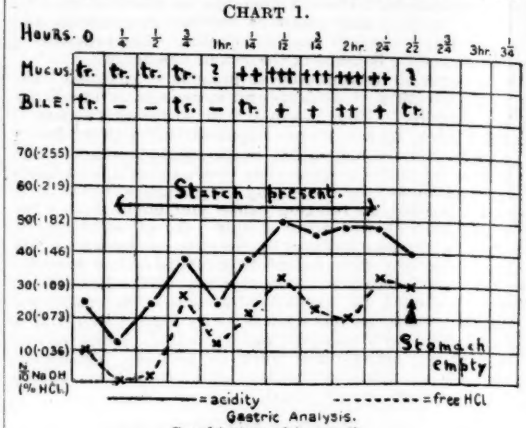
The present report consists of: (1) An abridged account of the technique. (2) Reproductions of specimen charts illustrating (*a*) physiological, (*b*) pathological phenomena. (3) A summary of the advantages of the fractional method of gastric analysis.

Technique.

The tube employed has been a rubber one, equal to a No. 6 or 8 soft catheter. Attached to the lower end is a small oval brass bulb containing numerous perforations. This is swallowed by the patient and the tube is rapidly "paid out." With explanation and kindly encouragement there should be no failures. Both in the descent of the tube and during withdrawal there is a tendency for the bulb to stick at the constriction corresponding with the cricoid. In withdrawal no force should be employed, but the patient should exert slight tension on the tube and swallow. As the wave of relaxation passes over it the bulb slips into the mouth. With the tube in place a specimen of resting juice is withdrawn and the total amount if necessary measured. A Record or all-glass syringe should be used for preference for withdrawing samples. A rack of 10 or 12 numbered test-tubes is at hand. The patient without withdrawing the tube drinks one pint of test-gruel prepared according to a fixed recipe,[2] and at intervals of quarter of an hour specimens of about 10 c.cm. in bulk are aspirated. After sedimentation in the tubes has occurred naked-eye observations are made of the food-content and the presence and amount of mucus and bile; the free and total acidity are determined quantitatively by the usual tests; and the time of disappearance of starch is noted by adding iodine to the residue in the tubes.

An average curve in a healthy subject presents the following features. From a resting free acidity varying between 0 and 20 (N/10 NaOH), and following an initial fall due to dilution, there is a gradual rise up to 1½ or 2 hours, the maximum seldom exceeding 40 for the free or 60 for the total acidity. The curves run closely parallel. There is a slight drop from 2½ to 2¾ hours, at which time emptying is usually complete. The starch disappears in the last or penultimate specimen. There is a tendency for the mucus to increase as the food diminishes. Bile regurgitation may be present in the resting juice, and occurs at some period of the cycle—usually towards the end—in about 50 per cent. of healthy males. The criteria of approaching emptying are the withdrawal of frothy specimens of small bulk, the appearance of bile, and the disappearance of starch.

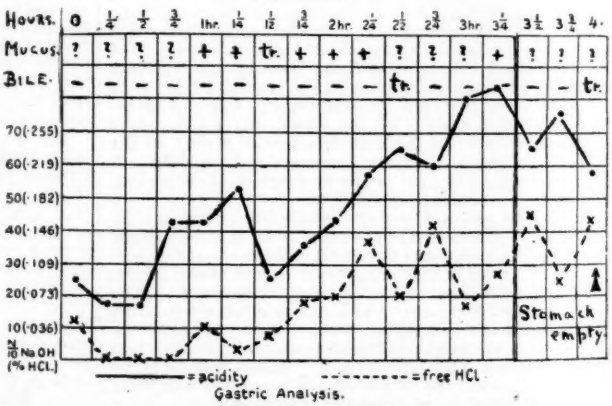
CHART 1.



Gruel test-meal (normal).

The figures for the acid are lower than those obtained with Ewald's test-meal, probably on account of the elimination of the psychic factor, the oatmeal gruel being somewhat unappetising and demanding no mastication.

CHART 2.


Hours. 0 ¼ ½ ¾ 1hr. 1¼ 1½ 1¾ 2hr. 2¼ 2½ 2¾ 3hr. 3¼ 3½ 3¾ 4·
Mucus. ? ? ? ? + + tr. + + + ? ? ? + ? ? ?
Bile. – – – – – – – – – tr. – – – – – tr.
70(·255)
60(·219)
50(·182)
40(·146)
30(·109)
20(·073)
10(·036)
Stomach empty
N/10 NaOH (% HCl.)
= acidity
= free HCl
Gastric Analysis.

Milk test-meal (normal).

Specimen Charts.

Chart 1 was obtained in the writer's case. It may be regarded as an average normal curve; it conforms with the type of curve obtained in upwards of 75 per cent. of healthy males.

Chart 2 shows the result of a milk test-meal of one pint obtained in the writer's case. Note the high-rising total acidity indicating the specific food response; the inverse ratio of free and total acidity after 2 hours possibly indicating acid-protein combination; and the slow rate of emptying—4 hours—probably due to the presence of fat, since skimmed milk in equal bulk emptied in 2¼ hours, while a meal of

[1] Based upon a communication made to the meeting of the Association of Physicians at Manchester.

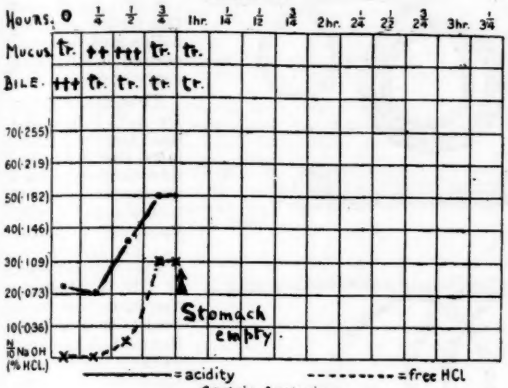
[2] Mix two tablespoonfuls of breakfast oatmeal with one quart of water. Boil slowly down to one pint. Strain through muslin. Add salt to taste and give warm.

cream and water of similar bulk took 4½ hours to empty, and after the initial rise, probably caused by the water, showed a very low output of HCl.

Chart 3 shows the result of drinking half a pint of water. Emptying was not complete for 55 minutes, but took place rapidly after the free acid reached 30. Emptying appeared to become active at this degree of acidity in all the writer's tests, the attainment of this point, at whatever phase of the curve it occurs, coinciding with the most active subjective peristaltic sensations and sometimes with audible borborygmi.

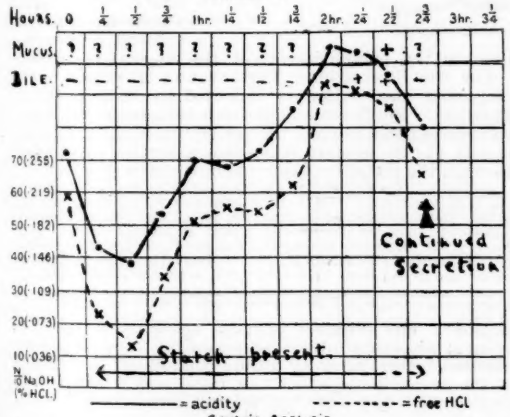
In experiments extending over a period of a month no effect on resting or active juice as the result of deficient or excessive salt intake could be demonstrated. The resting juice was found to vary in its free acidity from 0 to 20 and showed wide variations in the actual amount obtainable.

CHART 3.



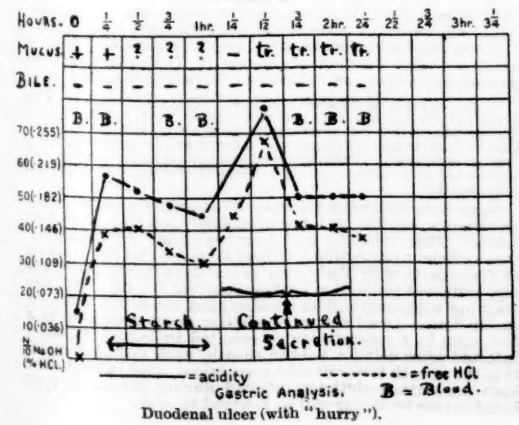
Water test-meal (half-pint) normal.

CHART 4.



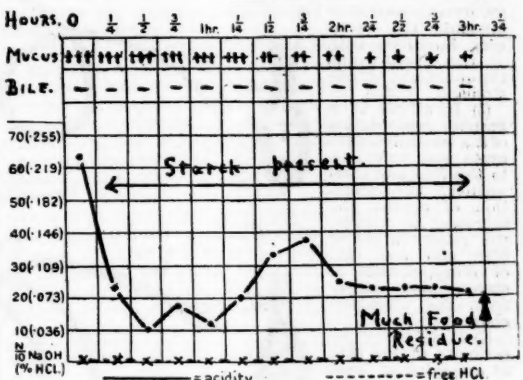
Duodenal ulcer (without "hurry").

CHART 5.


Hours. 0 ¼ ½ ¾ 1hr. 1¼ 1½ 1¾ 2hr. 2¼ 2½ 2¾ 3hr. 3¼
Mucus. + + ? ? ? – tr. tr. tr. tr.
Bile. – – – – – – – – – –
B. B. B. B. B. B. B.
70(·255)
60(·219)
50(·182)
40(·146)
30(·109)
20(·073)
10(·036)
N/10 NaOH (% HCl.)
Starch.
Continued Secretion.
= acidity
= free HCl
Gastric Analysis. B = Blood.

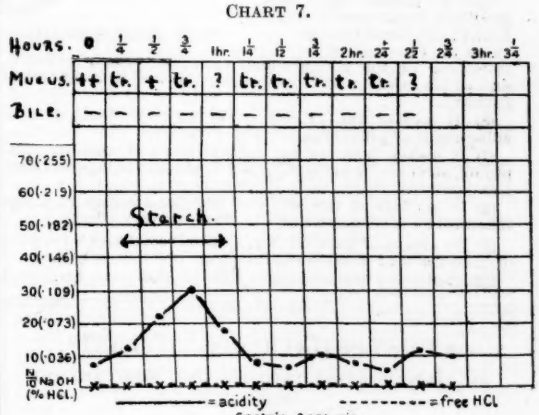
Duodenal ulcer (with "hurry").

CHART 6.


Hours. 0 ¼ ½ ¾ 1hr. 1¼ 1½ 1¾ 2hr. 2¼ 2½ 2¾ 3hr. 3¼
Mucus. +++ +++ +++ +++ +++ +++ ++ ++ ++ + + + +
Bile. – – – – – – – – – – – – –
70(·255)
60(·219)
50(·182)
40(·146)
30(·109)
20(·073)
10(·036)
N/10 NaOH (% HCl.)
Starch present.
Much Food Residue.
= acidity
= free HCl
Gastric Analysis.

Pyloric neoplasm.

CHART 7.



Acne rosacea showing achlorhydria.

In the pathological series:—

Chart 4 is from a case with history and symptoms strongly suggestive of duodenal ulcer. Note the high acidity of the resting juice, which is very copious, the steep-climbing curve, and the continued secretion. Curves of this character have been very constantly obtained in "duodenal" cases.

Chart 5 is from a case of duodenal ulcer confirmed at operation. In this case a clinical and X ray diagnosis of chronic gall-bladder and appendix was made. The additional diagnosis of ulcer was made on the test-meal result. Note that at one hour the acidity is within normal limits, whereas half an hour later there is definite hyperchlorhydria. Note also the extremely rapid emptying—"duodenal hurry"—the presence of blood in 8 out of 10 specimens, and the continued secretion.

Chart 6 is from a man, aged 51, whose clinical features strongly suggested growth; vomiting was absent, but the test showed very definite pyloric delay. In addition there is achlorhydria and a big disparity between free and total acidity.

Chart 7 is from a case of acne rosacea. In this condition, the association of which with indigestion is well recognised, achlorhydria or marked hypochlorhydria has been very constantly demonstrated.

Summary.

The advantages of the fractional method of gastric analysis may be summarised as follows:—

(1) Its technique is extremely simple. Both for patient and operator the manipulations involved are easier and less unpleasant than is the case with the large stomach-tube.

(2) It is probably the best method yet described for investigating and also for demonstrating to students the secretory functions both of the healthy and the unhealthy human stomach. For—

(3) It allows of a graphic presentation of the whole digestive cycle with reference to the free and total acidity, the secretion of pepsin, the secretion of mucus, the regurgitation of bile, and the rate of disappearance of starch and sugar from the examined contents.

(4) It allows of an estimate of the rate of emptying at least as accurate as that obtained by means of radiography and the barium meal.

(5) It allows of qualitative and quantitative investigations of the resting juice and of the post-prandial secretion (when present), and of its cytology and bacteriology, as well as its chemical features.

(6) It avoids the fallacy of a one-hour reading with subsequent or previous abnormal variations.

(7) It makes possible the investigation of certain symptoms, such as "heartburn" and of pain, having special time relationships.

(8) It permits of the study of the local action of drugs taken into the stomach and of reflex secretory effects.

(9) By means of parallel X ray examinations a correlation of chemical and mechanical functions becomes possible.

(10) Owing to the whitish colour of the gruel employed and the number of specimens withdrawn small quantities of macroscopic blood are much less likely to escape detection than with the older methods.

If necessary investigations can be pursued beyond the pylorus, as, with X ray coöperation, the bulb can easily be passed into the duodenum.

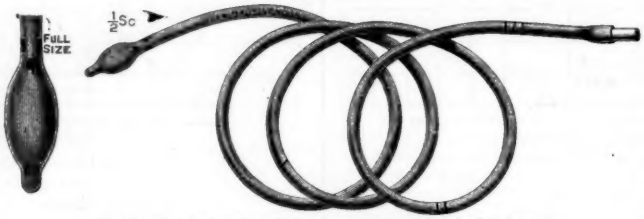
No attempt has been made in this communication to base conclusions on the results thus far obtained, for the inquiry, so far as the writer and his colleagues are concerned, is still in its early stages.

Thanks are due to Dr. A. F. Hurst, who has largely stimulated the investigation and provided numerous cases of interest; to Dr. M. S. Pembrey and Dr. J. H. Ryffel, in whose laboratories at Guy's Hospital the work has been done; to Dr. T. I. Bennett, who is at work on normals and also upon pharmacological effects; and to Mr. M. Maizels and numerous students who have voluntered to act as subjects in order to help in the establishment of the normal variations.

For the illustrations (Figs. A and B) of the tubes employed the writer is indebted to Messrs. Down Brothers. Fig. B is a modification designed to facilitate swallowing and to avoid the possibility of slight trauma to the gastric mucosa when strong suction is exerted through the metal bulb on an almost empty stomach.

FIG. A.

FIG. B.



Tubes used in fractional gastric analysis (described in text).

References.—Rehfuss and Hawk: Journal of American Med. Assn., vol. lxiii., No. 1, p. 11. Rehfuss, Bergeim and Hawk: Ibid., No. 11, p. 909. Rehfuss and Hawk: Ibid., No. 24, p. 2088. Fowler, Rehfuss and Hawk: Ibid., vol. lxv., No. 12, p. 1021. Rehfuss: Ibid., vol. lxiv., No. 7, p. 569. Rehfuss, Fowler and Clarke: Ibid., vol. lxiv., No 21, p. 1737. Rehfuss: American Journal of Medical Sciences, 1914, p. 848. Crohn and Reiss; Ibid., 1917, p. 857; 1918, p. 801; and 1918, p. 656.

ANTISYPHILITIC PROPHYLAXIS:

AN INVESTIGATION INTO ITS USE, NON-USE, AND MIS-USE.

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IN order to arrive at some figures with regard to the use of venereal disease prophylaxis by men and at some true information as to what, if any, precautions are being taken amongst the class of people who present themselves at one of the ordinary public centres for the free treatment for venereal disease, I have recently collected information from 608 cases who presented themselves at the syphilis clinic at the London Hospital under my chief, Dr. J. H. Sequeira.

Scope of Inquiry.

This report has reference solely to syphilitic infection and to no other venereal disease.

For the most part the men concerned were of the ordinary hospital out-patient class, but there were some more intelligent people amongst them, such as military officers or clerks. The plan adopted was the private questioning of each individual patient, and I have every reason to believe they answered questions truthfully. As far as possible the cases were taken consecutively as they came on certain special days for syphilis. Careful attention was directed towards accuracy of time of events; what precautions were used, and how used, and whether before, after, or during connexion; how much of the prophylactic agent was used, and whether the patient had had any intoxicating liquor at the time or not.

Many interesting and useful points were elucidated during the questioning.

Many contracted the disease while in France from "licensed houses," and because the houses were "licensed" they all, without exception, believed the women were "clean," and therefore took no precautions at all. This fully endorses what Lieutenant-Colonel E. T. Burke, R.A.M.C., says in his article[1] on "Venereal Disease in War":—

"The licensing of brothels and the medical examination of the inmates possess not the slightest value. This has been fully proved wherever it has been tried. In spite of medical examination it is quite impossible to guarantee that any public woman is free from infection. Regulation gives a false sense of security and makes the authorities directly responsible for any infection that may result."

Some believed that a solution of potassium permanganate, or Condy's, applied by a few moments' douching, and of no matter what strength and how long after the connexion, was sufficient protection. Others believed that the washing of their parts with their own urine, even hours after, was also sufficient protection against venereal disease. Ordinary washing with soap and water soon after connexion was very rarely done. Lysol and other similar drugs were used by a few, even to a strength which resulted in burns. Of those infected after using a rubber sheath, each definitely states that the sheath broke during connexion. (See below.) The high percentage of those infected during partial or total intoxication by liquor will be referred to later.

Of the 608 cases only 12 had used, in various ways, prophylactic outfits—"packets"—with calomel ointment (33 per cent.). These I have labelled "special" cases in the table of results of inquiry, and will give their details later.

Table of Results of Inquiry.

(1) Took no intoxicating liquor and used no prophylaxis at all	287
(2) Intoxicated	102
(3) Partially intoxicated and used no prophylaxis at all	67
(4) Partially intoxicated and used pot. permang. within 10 minutes of connexion	5
(5) Partially intoxicated, but bathed with own urine within 10 minutes of connexion	8
(6) Used pot. permang. within 10 minutes of connexion	24
(7) Used pot. permang. from 10 minutes to 12 hours after connexion	51
(8) Used soap and water within 10 minutes of connexion	10
(9) Used tap water only within 10 minutes of connexion	14
(10) Bathed penis with own urine within 10 minutes of connexion	16
(11) Used rubber sheath which broke during connexion	5
(12) Used lysol or similar drug within 10 minutes of connexion	7
(13) "Special" cases (calomel—see below)	12
Total	608

From this table it will be seen that the following information can be extracted:—

Total number of those using no prophylaxis (1, 2, 3)	456, or 75%
Total number of those under influence of liquor (3, 4, 5)	182, or 29·9%
Total number using pot. permang. (4, 6, 7)	80, or 13·2%
Total number bathing in own urine (5, 10)	24, or 3·9%

Details of "Special" Cases.

CASE A.—Four hours after connexion, rubbed half tube of calomel from a packet on to the glans only. Did not rub any into the corona or on the body of penis. Chancre developed on the body ½ inch behind the frenum, where he did not rub any calomel.

CASE B.—Quarter of an hour before connexion injected half tube of nargol into urethra and placed half tube of calomel around corona. Twelve hours after connexion used other half of each tube as before. Chancre developed ½ inch behind frenum on body of penis where he did not rub any calomel.

CASE C.—Had connexion three or four times with the same woman on three or four consecutive days and only used calomel after the last connexion of all. Immediately after the last connexion he washed his penis in water and rubbed on and injected calomel from a military prophylactic outfit, using one whole tube. Chancre developed on glans one month after. Had had other previous recent connexions when he did not use any prophylaxis at all.

CASE D.—Rubbed on quarter tube of calomel immediately before and after connexion, to glans, corona, and body only. Had "washout" at military prophylactic tent 10 minutes after. No sign of chancre on penis or scrotum, but his throat was very suspicious. He had post-cervical and epitrochlear adenitis, a macular rash, and condylomata at the anus.

CASE E.—Immediately before connexion used a navy packet. He injected about quarter tube into urethra and placed about quarter tube on glans. After connexion he did the same, using about the same amounts and also washed in Condy's one hour afterwards. He stated that there were no instructions how to use the tube in the packet. The chancre developed on the body side of the corona where he did not rub any calomel.

CASE F.—Half hour after connexion went to a military prophylactic tent where he washed the parts and syringed out his urethra with pot. permanganate and rubbed calomel ointment all over his penis, but using only half a tube. Three days later two sores developed, one on the prepuce and one on the frenum. He had had previous recent connexions when he did not use any prophylaxis at all.

CASE G.—Used nothing before or after the connexion. Three weeks later a sore developed on the glans which he reported to his medical officer, who instructed him to use calomel ointment. He used one whole tube.

CASE H.—Before and after connexion he rubbed on calomel to penis only, from a Canadian Red Cross packet. No chancre developed on his penis, the primary lesion being in his throat.

CASE I.—Two hours after connexion he rubbed on and injected calomel from a military outfit. Owing to not being able to get his prepuce back he was unable to get any ointment there and that is where the chancre developed.

CASE J.—Thirty-six hours after connexion he injected quarter tube of nargol into urethra and placed on quarter tube of calomel around the corona, from a "Dreadnought" outfit. Two weeks later he developed two sores in the corona. He had had previous recent connexion, when he used no prophylaxis at all.

CASE K.—Quarter of an hour after connexion he injected half tube of nargol into urethra and rubbed on half tube of calomel on to penis and scrotum, from a "Dreadnought" outfit. Chancre developed on left inner side of thigh where he did not rub on any calomel ointment.

CASE L.—One hour after connexion he injected quarter tube of calomel into his urethra, and rubbed three-quarters tube on to glans and corona from a military outfit. Chancre developed on middle of body of penis four weeks later, where he had not rubbed on any calomel ointment. Ten days previous to this connexion he had had another, when he did not use any prophylaxis at all.

Discussion of Results of Inquiry.

That 30 per cent. of the cases were under the influence of drink at the time tells its own story. Alcohol not only lowers the resistance, but it is asserted that connexion takes longer when under its influence. Hence there is a longer time for the parts to be in contact, and so the parties are more liable to infection. Also in the rare cases in which prophylactic measures were intended they would probably be omitted if the man were partially intoxicated, and certainly if he were totally intoxicated.

It must be well noted that there was not a single case of infection after using a rubber sheath, except when the sheath had broken actually during connexion. This fact led me to make inquiries from chemists and other shops where sheaths are sold, and from them I learned that an average of 10 gross per week were sold at each. One shop claimed to sell as many as 50 gross per week. These shops were in the central part of London. Granted that many were sold to married people and others to prevent conception, yet this also surely means that one of the best prophylactics we have is the rubber sheath. This means of prophylaxis is also advocated by Professor Gougerot,[2] who, under the heading of "Venereal Disease Can be Avoided," in his recent report to the Interallied Congress of Social Hygiene, says:—

"..... Before the act ..... grease the parts with calomel ointment or with some such ointment. Put on a substantial rubber sheath which has not already been used ....."

and in another place:—

"A good sheath, not having been used, is, in every way, the surest means of escaping contagion."

As regards prophylactic outfits—"packets"—only 12 of the 608 cases had used this system and all had in different ways applied the calomel ointment wrongly. Either they had used it only after connexion, or had not rubbed it in over all the parts recommended, or had used it much too late. It is important to note that of the 12, 3 developed extra-genital chancres; 1 used calomel after the chancre had developed; 1 applied calomel only after the last of a series of connexions lasting over several days; 3 had had previous recent connexions when they did not use any prophylaxis at all; 4 developed chancres at sites different from the site where they applied the calomel ointment, and one of these had also had a previous recent connexion, when he had not used any prophylaxis.

Here, again, the evidence points in favour of the efficiency of calomel ointment as a prophylactic against syphilis. From chemists I also asked for information about this ointment, and they stated that though they could not by law offer for sale or advertise the germicidal properties of the ointment, yet they sold quite a quantity to those who asked for it or had it ordered by a medical prescription. Professor Gougerot,[2] also in the same report, says:—

"..... Smear calomel ointment or in its place some similar ointment and use a sheath ....."

He also advocates the rubbing in of calomel ointment immediately after connexion.

Data Taken from Recent Military Experience.

The Canadian military authorities[3] actually issued 571,180 tubes to an average strength of 277,500 troops in Great Britain from April, 1917, to August, 1919, and their Y.M.C.A. branch in Paris, from November, 1917, to March, 1918, gave out 50,000 preventive tubes to 22,000 men of the Imperial Force who were on leave to Paris between those dates. This means that the number of tubes issued was about double the number of men.

In Paris from June to November, 1918 (five months), with abundant disinfectants given individually to the Anzacs[6] on leave, the number of infections was only 20, whereas in the five weeks, November–December, when the supply of disinfectants was temporarily cut off, the number of infections was 24. In October, 1918, there were approximately 5000 troops on leave, a large proportion being Anzacs, among whom in that month there were only 3 infections, whereas among the English, who were not nearly so well supplied with disinfectants, there were in that month 42 infections. Also in August to September, 1917, when there

was no issue of disinfectants, over 5000 troops came on leave to Paris and over 1000 of them became infected, whereas in November, 1917, to March, 1918, when over 30,000 came on leave and there was an issue of disinfectants, only 3 per cent. became infected.

From this I would deduce that the prophylactic system was not a failure, but the results show that, if properly carried out, this system was reasonably effective in preventing venereal disease.

More recently still have been published the results of the prophylactic system in use at certain military units at Portsmouth,[7] where the rate of infection of venereal disease fell to 1·5 per 1000 per annum, and now the town council of Portsmouth is seeking to popularise methods of prevention among the civil population of the borough. At Liverpool military camp in New South Wales[8] the rate of infection was also greatly diminished by such a system.

Most people, I think, agree that calomel ointment is an almost sure agent if applied correctly, and I want to lay great emphasis on the fact that all "packets" should have proper instructions for use enclosed, especially insisting on the use of both a sheath and calomel ointment at the same time, for, as Lieutenant-Colonel G. Raffan, A.A.M.C.,[5] points out:—

"Rubber sheaths alone are not safe, they vary in quality and are sometimes very fragile ..... a (calomel) lubricant in addition is desirable."

Had the 5 cases quoted in my table above used calomel ointment as well as the sheath, and had 6 of the 12 "special" cases applied the calomel correctly, most probably they would not have become infected.

Pitfalls and their Avoidance.

It is also necessary to emphasise very strongly, in the instructions, that the influence of alcohol at the time notably increases the risk of infection. The calomel ointment should be rubbed in well, not merely placed on all parts. It is said that calomel is apparently converted into perchloride[4] within the tissues—hence the need of rubbing it in.

To guard against attempts at self-treatment by infected people with outfits it should be clearly stated in the instructions that the outfits will only prevent and not cure.

These, I think, are the chief points bearing on the figures I have obtained. The above and other instructions as regards other drugs and their method of use have been published many times, but from my figures as regards syphilis it cannot be too well drilled in that alcohol is to be avoided at the time, that calomel ointment must be rubbed in, and that at the same time suitable precautions must be taken against other venereal disease.

Lastly, the importance of early treatment centres cannot be overlooked, especially as such a great percentage become infected when under the influence of liquor and therefore use no prophylaxis at all. Early treatment centres should then be available the moment the man regains his senses.

Lieutenant-Colonel Burke[1] has recently published some extraordinarily good results, and I cannot do better than quote them here:—

Number applying for prophylaxis	894
Number of above who developed symptoms	Nil.
Number of venereal cases admitted	78
Number of these who had had prophylactic treatment...	2

Which clearly shows what can be done when prophylaxis is properly carried out.

After all, prophylaxis is only common-sense hygiene; and as Dr. Sequeira very aptly puts it: "It is for the same reason a surgeon washes and disinfects his hands before and after and wears rubber gloves during an operation."

I am greatly indebted to Dr. Sequeira for having allowed me to make these observations.

References.—1. Venereal Disease in War, Lieutenant-Colonel E. T. Burke, Quarterly Review, April, 1920. 2. Lutte Antivénérienne, Professor Gougerot, Congrès Interallie d'Hygiène Sociale, Paris, 1919. 3. Memo. to Parliament on Prophylaxis against Venereal Disease, the Hon. G. Waldorf Astor, M.P. (Chairman), August, 1919. Note by Colonel J. G. Adami, C.A.M.C. 4. Ibid., Note by Sir G. Archdall Reid. 5. Ibid., Note by Lieutenant-Colonel G. Raffan, A.A.M.C. 6. Memo. to Anzac Soldiers, Miss E. A. Rout, April, 1919. 7. The Times, May, 1920. 8. Commonwealth Report on Venereal Disease.

THE PRINCIPLES UNDERLYING THE STANDARDISATION OF AGGLUTINABLE CULTURES.

With a Note on

THE APPLICATION OF DREYER'S SYSTEM TO B. PARATYPHOSUS A.

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IN attempting to form a true estimate of the value of Dreyer's system of standardisation it is important to give separate consideration to its two aspects: (1) The general principles upon which it is based; (2) the particular applications of the principles to serological practice that have been made or proposed. A number of private discussions concerning the use of standardised cultures have made it clear that a statement of general principles is needed if tiresome misunderstandings are to be avoided.

The present article is an attempt to state these principles and their working in general terms without reference to the various published criticisms of Dreyer's method, for these have dealt almost entirely with standardisation in clinical practice. The reader is, however, recommended to peruse Part I. of the Medical Research Committee's Special Report Series, No. 48 (1920), in which certain observations of Drs. W. W. C. Topley, A. C. Imrie, and S. G. Platts seem to conflict with some of the principles here stated.

The Measurement of Agglutinating Power.

The possibility of making some kind of measurement of the agglutinating power of a serum has long been recognised, and the expression of such measurements in figures representing the highest dilution in which complete (or partial) agglutination occurs has become an established practice in bacteriological laboratories all over the civilised world.

The great majority of workers in this sphere have employed living or killed agar cultures of the bacilli for their agglutination tests, and it has been tacitly assumed that 24 hours agar cultures suspended in salt solution form a material so constant in agglutinability that they can be satisfactorily employed as a standard for the measurement of the power of a serum.

I use the word "standard" advisedly, and for this reason: It is axiomatic that no measurement or series of measurements can be made without a standard. Every measurement is a comparison of X with Y, wherein Y is the standard whereby X is measured. If Y be a permanent and constant quantity it can be used as standard for an indefinite series of measurements; but if it be perishable or an unreproducible quantity it can only be used for the single operation. Measurements of length are only possible if we choose an object of a particular length as our standard and compare with it the articles which we desire to measure. Every man can have his own standard of length, if he will, and make his measurements with it to the highest possible pitch of accuracy. But in such a case John Smith, who has chosen the span of his right hand as his unit, will suffer no little inconvenience when purchasing articles from Dick Robinson, whose custom it is to measure with the cubit. A laborious process of translation will have to be gone through at each transaction. Language is another simple case of standardisation. A word is but the standard sound agreed on by a group of persons for the expression of an idea; and it would clearly be an enormous convenience and saving of time and labour if the whole civilised world could agree to a single set of standards, though this might possibly bring with it, in our present state of civilisation, disadvantages in the realms of history and sentiment heavy enough to outweigh the practical gain.

But to return to our subject, we must be clear as to what has hitherto been the actual standard in agglutination tests. Our custom has been to measure the highest dilution of serum that can bring about a definite change in a suspension of bacteria. Since we are dealing with only two materials, serum and culture, and since the former is being measured, it is clear that the culture is the substance *by means of* which we are measuring it.

The actual comparison is, of course, not between serum and culture, but between one serum and another serum measured either with the same culture or with another which has been assumed to be of identical agglutinability. The culture is thus our standard, though a standard of a nature slightly different from that of simple standards of length, weight, and so forth.

Just as we have seen that any man may make perfect measurements of length by means of any unit that takes his fancy, so any man can make accurate comparisons of the power of two or more sera by means of any specific bacterial suspension he may chance to make, though his tests must be done all at once and can never be repeated if the bacteria are alive and unfixed, for his standard is perishable. If he has killed and partly fixed his bacteria, in bulk, he has a much better but still imperfect and undurable standard available until it is all used up.

Now the whole of the system of agglutinin measurements in the past has been based on the assumption that all 24-hour cultures of a given bacillus possess a sufficiently constant degree of agglutinability. If this were so they would constitute a satisfactory standard material; but it is not so. Not only do they vary, but they vary profoundly. A strain of the typhoid bacillus may yield one day a culture which reacts with a ten thousandfold dilution of a specific serum, and another day may show no response to the same serum at 1 in 100. This is an extreme case, but variations of smaller though still very considerable amplitude are the rule; so that two successive subcultures of a typical and highly agglutinable strain of, e.g., *B. typhosus*, may differ by 100 or 200 per cent. in their end-titres with a serum.

It may be that future discoveries will enable us to control the exact composition of culture media and all the conditions of bacterial growth in such a way as to ensure the production with certainty of uniform living cultures of constant agglutinability. But this is at present impossible and is quite likely to remain so. The position, then, until recently may be described thus:—

In measuring the agglutinating power of sera bacteriologists have used a method in which the standard is the agglutinability of 24 hours' cultures of strains of the organism in question. Since the results of all measurements of whatever nature can only be expressed as multiples of some unit, a unitary system has had to be adopted here also. It is, however, "camouflaged," so that it appears superficially not to be a unitary system at all.

Let us analyse the expression "titre = 1/1000."

It means that the highest dilution of serum which gave the reaction was 1 part in each 1000 parts of the test mixture (serum and suspension). In other words, the least *quantity* of serum that reacted was one unit by measurement in every 1000 units by measurement of the mixture. This quantity is really the unit of agglutinating power[1] in this system of measurement. If we measure in cubic centimetres our result can be stated thus. By mixing 1 c.cm. of the serum with 499 c.cm. of diluent we obtain a mixture of such agglutinating power that 0·5 c.cm. of it will just react with 0·5 c.cm. of the suspension. This 1 c.cm. of final dilution may therefore be said to be 1 unit strong. The full-strength serum is, then, clearly 1000 units strong. But it is, in truth, only for the particular suspension in use that this statement holds good. With other suspensions the end-dilution and therefore the estimated strength of the serum would not be the same. Perhaps it is for this reason that the expression in dilution has been retained and an expression in units rejected. But a moment's thought will make it clear that, so long as our suspensions are unstandardised, our records of the strength of a serum are equally unreal, whether we use dilutions or units. There is no fundamental difference whatever between the two methods of expression, for the figures given by the one are merely the reciprocals of those given by the other. None the less, the first method has certain disadvantages from which the second is free.

(1) Expression in dilutions conceals the inner meaning of the system of measurement. If the words "standard" and "unit" had originally been employed it would always have been clear to all that the standard and unit in use were greatly in need of improvement.

(2) It is more bother to record fractions than simple figures. The mild irksomeness of writing fractions has, in fact, driven most serologists to record only the denominator of their dilution figures—e.g., to write "titre 1000" for titre 1/1000. Thus it is interesting to see that people have slipped into the way of recording their results actually, though not explicitly, in units (though not "standard" units).

For the reasons just given it is tolerably clear that an explicit recording in units is always preferable whatever system of measurement be adopted. A measurement which cannot be expressed in units is simply not a measurement and should be relegated to the sphere of mere qualitative observations. Every worker who expresses a result as a titre, without reserve or qualifications, assumes the existence of a standard and a unit. Otherwise, the figure he gives is absolutely void of meaning.

Methods Hitherto Employed.

We have come in our argument to this point.

(1) The common method of estimating "titre" of agglutinating sera makes use, as all methods of measuring must do, of a "standard" and of a unit. The standard is the 24-hours' living suspension of the specific organism, assumed erroneously to be of sufficiently constant agglutinability. The expression of "titre" in dilutions is simply an expression of the reciprocal of the strength of a serum in units measured by this standard.

Most workers have realised that there should be standard conditions of time, temperature, &c., for their reactions, and they at least do not omit to mention what conditions they apply to their tests. Some, however, while expressing their results in reciprocal units (i.e., dilutions), fail to realise that by omitting all mention of these fundamental experimental conditions they destroy whatever reality their measurement may have had for other workers. It is as though one man should ask of another, "How wide is the river?" and he should answer, "Fifty."

(2) The standard adopted in this method is a bad one.

Undoubtedly it has been better than none at all, for it has enabled a certain stage of knowledge to be reached. It is a bad standard because a highly variable one. Usually approximately true within certain wide limits, its fluctuations could on occasion be calamitous. Even if a single uniform technique had been in vogue the system was only capable of giving an answer comparable in precision with the schoolboy's answer: "It's as big as a lump of cheese."

The first, so far as I am aware, to realise the inherent weakness of the standard was Madsen, who devised a method whereby fluctuations of agglutinability in suspensions were discounted.

When measuring the power of an unknown serum he always compared it with a known serum, using the same suspension in testing the two. The strength of the unknown serum could then be expressed in terms of the known "standard" serum. By this method differences in the strength of two unknown sera could be determined with a fairly high degree of certainty.

It suffered, however, from the important weakness that all serums are unstable, and that therefore his standard was a constantly shifting one. This defect was remedied by Dreyer,[2] who worked out the technical process whereby bacteria can be made into suspensions of such stability as to be available as a trustworthy standard material on which to measure the agglutinating power of sera.[3]

Essentials of Dreyer's Process.

The main essentials of the process may briefly be stated as: (1) growth of the organism in simple fluid media such as broth; (2) sterilisation with formalin in the cold, by the addition of just enough formalin to kill and fix the bacilli (0·1 per cent.) and no more. These steps succeed in procuring a suspension of the following characters.

(*a*) The bacteria are dead and fixed, like museum specimens, and therefore do not autolyse. Autolysis in the early stages of the fixation process, which takes a few days, is largely inhibited by the low temperature.

(*b*) The organisms remain in the surroundings in which they grew up. This avoids damage such as is done in the violent exposure of agar cultures to the disintegrative influence of pure salt solutions.

(*c*) The suspensions contain no excess of antiseptic which might undergo change into acids or other bodies detrimental to the suspensions.

[1] Dreyer's expression "agglutinin unit" is objected to by some as a false expression which assumes the existence and measurability of a definite substance called agglutinin. But no such assumption is made by Dreyer, who employs the expression as a convenient abbreviation of "unit of agglutinating power." Perhaps it would be better to use the latter expression and avoid the word agglutinin, though it is a considerable convenience.

[2] Dreyer, G.: Hospitalstidende, No. 19, 1906; and Journ. of Path. and Bact., xiii., 331, 1909.

[3] The scope and purpose of this article makes it unnecessary to mention the immensely important work of other pioneers in agglutination technique.

(*d*) There is either no loss of agglutinability at all (e.g., the typhoid group) or a transitory loss of no importance (*B. dysenteriæ*).

(*e*) The characters of an emulsion are preserved for years without change.

(*f*) Successive suspensions of any strain can be tested against each other, and each can be given an "agglutinability-constant" which expresses its precise degree of agglutinability relative to one of the suspensions arbitrarily chosen as standard. This process, then, provides us with a method whereby true measurements of the power of any serum may be obtained; for we have a stable and trustworthy standard of reference, which confers on our measurements a reality which was unattainable by means of the bad standard hitherto in use.

Its Scope and Limitations.

Before discussing the scope and limitations of Dreyer's standard unitary method and in order to clear the ground it must be clearly stated that the principle of the method is of theoretically universal applicability wherever quantitative agglutination tests are to be made, whether they form a part of experimental or of routine clinical work. Let us first of all consider its application to a kind of research that is much practised at the present time.

Suppose we have obtained from a clinically similar group of sick persons a number of strains of bacilli whose main cultural characters are those of some already known organism. We propose to identify fully and classify the bacilli by means of cross-agglutination tests. So we make a number of agglutinating sera with stock strains of the known organism and with each of the bacilli we isolated. The question arises, How shall we make the suspensions to be used in the tests? The decision depends upon whether or no we take into account the fact that no two sub-cultures of a strain can be assumed to have the same degree of agglutinability.

It will be of interest to compare the results of neglect of the variability-factor with the effects of its recognition in an imaginary research. Suppose we are testing one of our new recently isolated strains against the known bacillus, cross-agglutinating both with sera made from each. We make to-day a living saline suspension of each bacillus. We standardise the bacterial content by some adequate method, in order to eliminate the effect of variations in the mass of bacilli acted on. We test them both with the serum of the known bacillus ("known serum") and find that the highest dilution in which known bacillus is agglutinated is 1/1000. The reading for the unknown bacillus with the same serum is 1/500.

The next step, which we carry out the next day, is to test the two strains with the serum made with the unknown bacillus (unknown serum). So we make two fresh living suspensions as before, put up the test, and obtain the following readings.

Unknown serum { Known bacillus 1/1000. / Unknown bacillus 1/2000.

What conclusions can we draw from these two tests? We can undoubtedly conclude that the two organisms belong to the same group, but what about their serological identity? We can draw no conclusion whatever.[4] And the reason is that in the former experiment we may, for all we know, have been dealing with a "known bacillus" suspension of supernormal agglutinability and in the latter with a normal or subnormal suspension. "Unknown bacillus" may have given yesterday a roughly normal suspension, to-day one of high agglutinability. If this has been the case, our results are compatible with a complete serological identity of the two strains.

But it may equally well not have been the case. We can with equal reason suppose that yesterday's "known" suspension was of low sensitiveness and the "unknown" suspension supernormally sensitive, while to-day we have happened to meet with reversed conditions. In this case it is clear that the two experiments have made the strains appear much more similar than they really are.

These experiments, therefore, leave us absolutely in the dark as to the true relationship of the two strains, and all because we have failed to eliminate the variability-factor of suspensions.

It may be objected that in the instance given variations in agglutinability of 100 per cent. are represented, and that such variations do not occur, or at least are rare. But they undoubtedly do occur, and by no means uncommonly. And in any case if it be granted that they occur at all, it follows that every test of the nature described is necessarily an object of suspicion. Again, it may be objected that any sensible person would test the two sera of our illustrative experiment on the same day, using only the one suspension of each strain for the purpose. Yes, but he may have scores of strains to test with dozens of sera, and he cannot possibly test them all on the same day. He will therefore have to make more than one suspension of some strains, since unformalised suspensions do not "keep."

I have attempted to make it clear that variations in sensitiveness of successive cultures of an organism have vitiated the quantitativeness of our agglutination tests, and have had the effect at the best of hiding otherwise ascertainable facts, or, if we are unaware of the weakness of our method, at the worst of leading us to definitely erroneous judgments.

Advantages of Dreyer's Method.

Now let us, in imagination, repeat the same experiment with Dreyer's method.

Dead formalised cultures of the two strains are made and diluted to the requisite density. It would be best, of course, to make enough of each to last through the whole series of experiments; but let us suppose for the sake of demonstration that we are compelled by circumstances to prepare new suspensions for each experiment. For the first day's test, then, we have suspension (1) of unknown bacillus, and suspension (1) of unknown strain.

With the known-strain serum we find that first known suspension gives its end-point at 1/1000, and first unknown suspension at 1/500. These two suspensions are our standards for the two strains, and the remainder of each is stored until our next experiment. Some days (weeks or months) later we test the unknown-strain serum on two new suspensions.

As a preliminary we test the second "known" suspension against the first known suspension (with the homologous serum) and find that it possesses only half the agglutinability of suspension No. 1—i.e., that it takes the double quantity of serum to agglutinate it to the end-point. By the same process unknown suspension No. 2 is standardised against unknown No. 1, and its agglutinability is found to be double that of No. 1. We can express the findings thus, placing the sensitiveness of the standard suspension in each case as unity.

Suspension.	Agglutinability-factor.	Suspension.	Agglutinability-factor.
Known No. 1	1·0	Unknown No. 1	1·0
Known No. 2	2·0	Unknown No. 2	0·5

We now carry out the test of the two No. 2 suspensions with the unknown serum, and we obtain these readings:—

Known susp. No. 2, 1/1000. Unknown susp. No. 2, 1/2000.

Before forming any opinion as to the meaning of the results we translate the figures into standard units thus:—

Reciprocal of dilution. Known serum.	Agglutinability constant.	Standard units.	Reciprocal of dilution. Unknown serum.	Agglutinability constant.	Standard units.
Known culture. (1), 1000.	1·0	1000	Known culture. (2), 1000.	2·0	500
Unknown culture. (1), 500.	1·0	500	Unknown culture. (2), 2000.	0·5	4000

From these figures we conclude that each serum agglutinates its own strain more highly than the other strain, and therefore that our experiments have yielded prima facie evidence that the strains are serologically distinguishable. This information could not have been obtained with unstandardised suspensions, as we have seen.

The Value of Standardisation.

I need not elaborate the argument by showing what our conclusions would be if we found agglutinability factors other than those postulated. For whatever they may have been, our experiments would have yielded a definite piece of information which we could not have obtained with unstandardised suspensions. The reader will have noted that the argument is based on the belief that any two subcultures of an organism give a constant ratio of agglutinability when tested with any number of sera. This belief is not a mere assumption, but rests on much routine experience and on direct (unpublished) experiment. The only published observations that weigh in any way against its truth are in the Medical Research Committee's Report mentioned above. It may be well to take another instance of the value of standardisation in agglutination experiments.

[4] It has been suggested to me that my illustrative examples are unconvincing, because nobody pays any attention in practice to variations of less than several hundred's per cent. If this be true, it constitutes an admission of the scientific weakness of current methods.

An experimenter wishes to study the variability of individual strains of bacteria as regards morphological, biochemical, and serological properties, and to attempt a correlation, if possible, of the various changes. Of this research it only concerns us to deal with his agglutination tests and to show how, by standardisation of his materials, he can ascertain facts which he could discover by no other means. His method, we will suppose, is to grow a strain of bacilli on some special medium for six months and to test its behaviour at intervals. If he is unfamiliar with, or distrustful of, the principle of standardisation he will naturally carry out his tests with fresh cultures of the organism. He makes an agglutinating serum in sufficient quantity to last over the whole experiment, and with it he tests the suspensions made, let us say, one every week.

Plotting a curve from these observations he finds it to be very spikey and wobbly ("experimental error" he calls this) and to show a slight but constant decline.

What conclusion can we scientifically draw from such a curve? He can only say: either the culture has remained unchanged in sensitiveness, while the serum has degenerated slightly; or the agglutinability of the culture has increased somewhat, but the serum has lost enough to overbalance that change; or, both the culture and the serum have lost very slightly.

In fact he remains in ignorance of what has occurred.

On the contrary, if he avails himself of the principle of standardisation, he will make at the outset of the experiments a good quantity of killed, formalised culture, and will make a careful quantitative comparison of each new specimen with this standard suspension by means of a stock homologous serum. In this way he can work out a trustworthy curve of the rise or fall of agglutinability of the living culture. If his standard suspension runs out during the course of the research, he will have made a second one, and standardised it against the first. By means of the reduction factor the curve can be levelled at the point where he changed over to the second standard culture.

A Plea for Recognised Standard Type Cultures.

These two instances must suffice to illustrate the general applicability of the standard principle to quantitative agglutination work in any particular series of experiments, and we will pass on to the question of its wider application in the form of publicly recognised standard cultures for use in routine tests and as starting-points in research work.

So soon as properly conducted researches have succeeded in making a provisional serological analysis of a hitherto uncharted group of organisms, a central institute can be directed to manufacture[1] on a large scale standardised suspensions of the various type-strains which represent the most salient constituents of the group. It should be made clear to all who make use of these type-standard cultures that the act of official manufacture does not imply any dogmatic sense of finality as to the constitution of the group, but is simply a step taken for the convenience of workers in that field whereby fixed points are provided for the starting of further research.

Incidentally, the standard cultures may at once be tested on a large scale for the purposes of clinical diagnosis of infections with the group; and it can be determined which of them it is necessary to employ in order to secure the maximum of certainty in routine investigation. The Standards Institute would then adopt the policy of supplying the necessary cultures (and corresponding sera) to clinical workers in this field, together with an explanatory pamphlet.

The actual standardisation of the cultures and the proper use of the reduction-factor by clinical workers would ensure the uniformity of records, and thus facilitate the accumulation of material which would have a far greater statistical value than similar records obtained by an unstandardised method.

The minor advantages of a central supply of material for routine diagnosis were made obvious during the late war. These are reliability and sterility of the cultures and the saving of time to individual workers.

Since the cultures are standardised they can always be employed in tracing the rise and fall of the agglutinin curve in infected or inoculated persons or animals with a precision exceeding by far that obtainable with unstandardised suspensions.

Returning to the more important question of experimental work, I must explain more clearly how standard cultures may act as fixed points for further research.

A worker of repute has, for instance, classified a group of bacteria into two main types, and his work is confirmed, in the main, by other independent observers. The Standards Institute obtains his type bacilli, puts them through a thorough experimental investigation, and confirms the findings. So standard cultures are made with the type-strains and offered for circulation.

Another worker wishes to experiment upon the permanence of the stock types—i.e., to find out whether they do or do not alter their serological characters from time to time.

From what we have already seen, a proper standard technique is necessary if such a research is to obtain all the available evidence. This being so, it will be not only a convenience to the worker himself if he can obtain reliable standard cultures of the type-strains instead of having to start ab initio and make his own, but there will also be a definite gain to the scientific community in the fact that he will be using the same standard unit as everyone else for these type organisms, instead of erecting for himself, without any advantage to himself or anyone else, a new standard unit for each. For every strain used in his research other than the stock types he will have to make his own standard unit, until it be proved for certain that the strain is serologically identical with one of the stock types. If the work shows that the officially standardised strains do not adequately represent the whole group their number can, of course, be increased.

Now suppose that it has been conclusively shown that every strain of the group varies from time to time in serological characters, so that at one time a strain appears to be type A and at another time to be type B, and that its characters under no circumstances became fixed; then the principles of standardisation would no longer be applicable, for no single strain of the group would be a serological entity at all. Up to the present, however, no organism of any species has been shown to behave in this way, and therefore the principle holds good, in theory, for all bacteria.

We may ask, What is there in all this that can be objected to as limiting the individual freedom and confining the genius of experimental bacteriologists? The answer is—nothing. Those who believe in standardisation desire that a certain amount of pressure should be brought to bear (by persuasion) on workers to adopt the best technique available at any moment, and more particularly to employ a good and uniform standard of measurement in place of a bad and insulated one. They are convinced that Dreyer's system is by far the best technical method at the present moment, and is the only one which provides a really sound basis of measurement. We have seen that its application is confined at first to individual researches; then, as knowledge grows, provisional public standards may be adopted for the furtherance of research and for immediate clinical utility.

Finally, when the characters of an organism or of a group are established on a firm and unshakable scientific basis, we may settle down to an unqualified acceptance of universal standard cultures for the organism or types of the group, for use both in clinical work and in experiments of all kinds. Even this latter could never restrict the liberty of workers, who would always have perfect freedom to invent a better system and replace the old standards with better ones. It would, in fact, always be one of the first duties of a Standard Institute to work perpetually on the betterment of existing standards and the discovery of new ones.

[1] Or to supply standard suspensions to the manufacturers, and to check and control the circulation of the manufactured article.

EXPERIMENTS ON THE AGGLUTINATION OF *B. PARATYPHOSUS A.*

The advance of experimental method in bacteriology, as in all sciences, calls from time to time for a reconsideration of accepted doctrines; and in no question is this more frequently necessary than in that of the classification of bacteria. In the last few years there has been a strong tendency towards the subdivision of species, hitherto accepted as entities, into a variable number of types or fixed varieties. The pneumococcus, the meningococcus, Flexner's bacillus, the bacillus of influenza, and several pathogenic anaerobes have in turn been submitted [to the analytic process. I am speaking of serological analysis, for this is a comparatively recent addition to the experimental outfit of a bacteriologist.

That in the great majority of cases these subdivisions reflect the truth to a greater or lesser degree I have no doubt; but it is often difficult to avoid the belief that the experimental technique employed has contributed an element of illusion to the findings. For instance,

the faith placed by many workers in the absorption method of Castellani does not seem fully warranted. Opinions of experts are divided as to its value, and my own experience has led me to support the view that it yields no true information unobtainable by simple agglutinations. When we find our agglutinations and our absorptions give discordant results, why should we assume that the latter have revealed to us a higher truth than the former? We are still very ignorant of the processes underlying our serological reactions, and, this being so, it seems the best plan to simplify the issue of our experiments by employing a straightforward method and, at the same time, sharpening it to the greatest possible degree of accuracy.

The Serological Identity of Strains of Paratyphoid A.

The experiments described in this paper prove, in my opinion, by simple agglutination tests the serological identity of all the strains of *B. paratyphosus A* employed. Were I, or another, to go over the same ground with absorption tests and discover diversity among the strains my deduction would be that this test, by its greater complexity, had led our judgment into error.

I do not know whether the serology of *B. paratyphosus A* has previously been closely investigated, but even if it had been it would be none the less desirable to work over the ground by means of Dreyer's technique, which is free from certain sources of error inherent in methods which include the use of unstandardised saline suspensions of bacilli. With Dreyer's method the same suspension may be examined and re-examined repeatedly over long periods, with the knowledge that its agglutinability is not changing. Every suspension thus provides a fixed point from which one may calculate variables—a scientific gain which cannot but be apparent to all.

Even with this technique we have certainly not yet mastered all the minor obstacles which stand in the way of consistently accurate measurements of the agglutinating power of sera. For instance, we have something to learn about the variability of agglutinating sera made with different cultures of a species—a phenomenon of which apparent instances are recorded by Topley, Platts, and Imrie,[1] and which undoubtedly deserves very careful investigation. It is my belief that all the apparent anomalies found by these workers in the case of *B. paratyphosus A* and possibly also of *B. paratyphosus B* are to be explained as technical variations, and not as evidence of serological variability. This is the teaching I have always had from Professor G. Dreyer, and every new investigation of my own has served to verify rather than to contradict it.

In the present paper I present tables of the comparative agglutinabilities of some strains of *B. paratyphosus A* when tested with a number of different sera, then I discuss some apparently anomalous results and demonstrate by experiment that they are due to the variable reaction-time of suspensions of poor quality.

The aim of the experiments was to establish prima facie evidence, with the limited material at hand, of the validity or invalidity of the view that *B. paratyphosus A* is a serologically uniform species.

Method:—In all essentials the technique employed was that recommended by Dreyer, under whom I have had extended opportunity of studying it. Thus formalised broth cultures have been employed throughout (0·1 per cent. of commercial formalin), and the suspensions were diluted with 0·1 per cent. formalised saline to a density similar to that of the suspension (standard culture para. A No. 27) which was used throughout as the standard of comparison. It happened that one suspension (para. A Charing X) was made, by error, distinctly thicker than the rest; and it is likely that this circumstance contributed something to the bad quality and irregular behaviour of this suspension. A single suspension of each strain was used throughout the comparative tests.

Some preliminary experiments were carried out by means of the short (Widal test) series of four tubes with a control. From the readings of these tests figures of relative agglutinabilities can only be calculated by means of Dreyer's reduction table.[2] Although this method is subject to a certain degree of error, since the table cannot be taken as fully applicable to paratyphoid cultures of variable quality, nevertheless these experiments have been included in the figures given in Table II. (two such tests with serum A 733 and one each with serum Charing X and B.W.); for the figures obtained were found in actuality to be little more variable than those gained by means of the long series of tubes which was used in the remainder of the experiments.

The most important advantage of the long series lies in its facilitation of direct comparisons of degrees of agglutination in any two series which are to be read against one another. Moreover, the fact that a number of readings can be taken reduces the error due to differences in the size of the individual tubes. Flocculation proceeds more rapidly in a relatively narrow tube than in a relatively wide one, and this influence may, in extreme cases, cause variations of 20 per cent. in a single reading.

In the water-bath the water level was kept constant, so as to cover about half the column of fluid in the tubes. This has been my practice since 1916, when it was adopted to accelerate the flocculation of dysentery cultures. Independent observations on the importance of this factor have been made and published by Topley and Platts.[3]

Readings were taken at two hours and again after 18 to 24 hours at room temperature. In the experiments on reaction-time, however, it will be seen that the tubes were compared after varying periods, up to 24 hours or more, in the water-bath. The usual readings taken were at least one coarse (standard) and one fine (trace) reading at two hours, and one fine reading at 24 hours. In some experiments only the finest obtainable readings were taken, since coarser readings, when cultures of bad quality are involved, provide much less accurate measurements of true agglutinability.

The sera were made by inoculating rabbits intravenously with one or more doses of formalised suspension of the bacillus. Serum B.W. was a commercial serum, possibly polyvalent; but unfortunately its history cannot be traced.

	Strains of *B. paratyphosus A* examined.	Source.
1.	*B. para. A* 1	Denmark.
2.	,, 2	,,
3.	,, 3	(Brion-Kayser).
4.	,, Cairo 1	Egypt.
5.	,, 228	America.
6.	,, 335	France.
7.	,, 733	,,
8.	,, Charing X	? England.

A number of others are included in Experiment I.

Section 1.—Determination of the Relative Agglutinabilities of Some Strains of B. paratyphosus A.

Table I. is included with the object of illustrating the fact that different suspensions of the same strain of *B. paratyphosus A* tend to show differences of agglutinability as great as those possessed by suspensions of different strains. All the strains but one came from a military hospital in France, and were never, so far as I know, put through any process of selection which could explain their fairly obvious homogeneity. The suspensions were mostly of poor quality for agglutination, as is so frequently the case with unselected strains of paratyphoid bacilli.

Table II. gives the results of cross-agglutinating eight strains of *B. paratyphosus A* obtained from all quarters of the world with three para. A sera. The figures obtained with serum 733 are averaged from four tests—those with serum Charing X from two tests, and those with serum B.W. spring from one test only. With the exception of culture A Charing X the deviations of the different figures from the mean are not wide enough to lend support to a theory of "serological strains." On the contrary, they may be taken as a demonstration of the uniformity of this group of cultures and sera from the serological point of view.

Culture para. A Charing X needs special consideration, since the wide variation of the figures obtained with it is highly suggestive of a serological variation. This question was therefore examined more closely, and it was found that the suspension was an exceedingly slow agglutinator—i.e., much more than two hours' incubation was required to bring it to its end-point of flocculation. In another respect also it was a very bad suspension, for its flocculation was always very incomplete.

Table VII. presents a reaction-time experiment performed with this culture (called culture Ch.X), wherein its velocity of flocculation is compared with that of a standard culture of good quality. Two different serums were employed, one homologous with culture O, the other with culture Ch.X. In both cases culture Ch.X shows a relatively very low agglutinability in the early stages of the incubation, but when incubated for longer periods manifests an agglutinability actually exceeding that of the standard culture.

The different effect of the two serums employed will be discussed below. From this experiment it is easy to see how such aberrant and variable figures as those in Table II. can be obtained with such a culture. Thus, an apparent exception to the serological uniformity of the strains dealt with proved on closer examination to be an unreality, due to the peculiarities of the particular suspension and not to a true serological divergence of this strain from the others. In a recent paper E. C. Hort[4] correlates vagaries in agglutin-

ability with the morphological characters of different suspensions. The few observations I have made on this point lend no support to his view, but it is one that calls for attention.

In Table III. is presented an additional series of experiments done with four of the same cultures as in Table II., but with the addition of two more serums. The figures represent the relative agglutinabilities of the cultures as found in a single test and calculating from two hours' readings only. With the exception of culture A 335 there is comparatively little variation in the relative agglutinabilities shown by the different cultures. 335 shows a much higher agglutinability with its own serum, and this might be taken as evidence of a true serological difference. It was therefore necessary to investigate the matter further by means of a reaction-time experiment. (See Table VI.) This culture was nearly as bad as culture A Charing X, and it proved to have a very slow flocculation-rate.

It has already been shown, in Table II., to be the second most variable suspension in the series. Its slow flocculability seems fully sufficient to explain how values so divergent as 175 and 88 can be obtained when different sera act upon the suspension and when the period of incubation terminates at two hours. The higher relative agglutinability manifested under the influence of homologous serum is discussed in detail in the next section.

Summary of Section 1.

In cross-agglutination tests of eight strains of *B. paratyphosus A*, obtained from widely different sources, with three different sera, and of four of the strains with five sera, no evidence was obtained of true serological differences among the strains. In two cases the figures were distinctly irregular, and were at first thought suggestive of true differences; but an examination of the specific behaviour of the two suspensions concerned led to the explanation of these differences by the incomplete, and, more particularly, extremely slow agglutinability of the suspensions. Prima facie evidence of the serological uniformity of the species has thus been established by means of a technique which allows comparative measurements to be made with considerable precision. To place the matter on a complete scientific basis a larger material will have to be examined.

Section 2.—The Rate of Flocculation of Formalised Broth Cultures of Paratyphoid Bacilli.

No one who has employed in a macroscopic technique a large number of suspensions of bacilli, either in salt solution or in diluted meat broth, can have failed to notice the irregular quality of suspensions of different strains and of successive suspensions of the same strain. They may be divided roughly into good and bad suspensions, according as they show complete flocculation with sufficient doses of a suitable serum, and a relatively rapid approach to the end-point of the reaction, or, conversely, a poor and partial flocculation and a slow reaction-time. Typhoid bacilli usually make good cultures, and paratyphoid bacilli commonly bad ones.

By a process of selection and cultivation in fluid media *B. paratyphosus A* can usually be induced to grow in such a way as to produce sufficiently good cultures, but failures are apt to occur even when these means are employed. Broth suspensions of para. A in the absence of special cultivation are more frequently bad than good, and cultures of para. B are, in my experience, almost invariably bad. In the manufacture of standard agglutinable cultures of the last-named organism this difficulty has been to a considerable degree overcome by the employment of a special selected breed of bacillus which grows spontaneously in loose clumps, the elements of which, when separated by a process of formalising, cold storage, and mechanical shaking, are peculiarly susceptible to rapid and complete flocculation by agglutinating sera. The occasional occurrence of colonies of this type of organism in platings of an ordinary *B. paratyphosus B* was demonstrated to me by Professor Dreyer, and I have had considerable opportunities of observing its characteristics, which will be described on some more appropriate occasion.

No such method of controlling the quality of para. A suspensions has yet been discovered, and the production of good material here has depended upon a process of selection combined with an element of chance. In the routine work of the Oxford Standards Laboratory success has not been uniform, and a great quantity of para. A culture has had to be discarded from time to time on account of its inferior quality. Occasionally during the war inferior cultures had to be issued, because demands were insistent and poor material was preferable to no material. Of such a nature were standard cultures para. A 23 and 32, which were among those employed by Topley, Platts, and Imrie in the research mentioned above. It is my belief that the discrepancies between their figures and the official ones in their Tables VII. and IX. particularly are an expression of the variability of the reaction and of the difficulty of observation of results obtained with second-rate material.

These facts, indeed, are a strong demonstration of the necessity of using good material for agglutination tests, and the best way of securing good material for all workers is by having it produced in properly equipped central institutes by specially trained persons who have the leisure to investigate the causes of inferiority in cultures and the means of improving them. It seems that fluid cultures of paratyphoid bacilli (and probably all bacteria) are composed of elements of variable agglutinability. When the conditions of growth favour the more highly agglutinable individuals a culture of good quality results, but in another set of conditions the elements of low sensitiveness outgrow their fellows, and the resulting culture is a bad one. All varieties, even down to apparently inagglutinable cultures, may occur. But the average bad culture seems to consist of a majority of bacilli which fail to flocculate within the time of observation and a minority which are readily flocculated. The latter, however, being scattered through the fluid, take a considerable time to come into contact with each other and so to form visible clumps. Convection currents in the fluid naturally facilitate the meetings of these elements, and so we find that the exposure of the upper part of the tubes to a lower temperature than the lower part has an even more evident accelerating effect on bad than on good cultures.

Table V. presents a simple case of a bad culture (para. A 34) with a slow reaction-time. At the end of three hours at 50–55° C. the good culture (A 27) appeared to be 4·17 times more sensitive than the bad one. Later reading of the tubes kept at the same temperature showed a progressive change in the ratio of agglutinability, until at 24 hours it was found to be only 1·22.*

TABLE I.

Twelve 24-hours' broth cultures of various strains of *B. paratyphosus A* roughly formalised and diluted to approximately the same opacity and agglutinated simultaneously by a serum made with strain 733. Short series of tubes. Date of experiment 19/3/1918.

Name of strain.	Date of stock culture from which broth culture was taken.	Actual readings (2 hrs.) 1/100	1/250	1/500
Para. A 335	15/6/16	t. —	? tr.	0
,, 333	17/6/16	t. —	0	0
,, Cairo 1	25/8/17	t. —	tr. +	0
,, 627	17/6/16	t. —	0	0
,, 674	29/6/16	t. —	0	0
,, 666	27/12/15	t. —	0	0
,, 360	17/6/16	t. —	0	0
,, 733	29/1/17	t. —	? tr.	0
,, 733	6/6/17	t.	s.	0
,, 733	22/2/18	t. —	tr. —	0
,, 733	18/3/18	t. —	0	0
,, 733	23/1/18	t. —	s. —	0

Symbols used.—t. = total; s. = standard (partial); tr. = trace of agglutination. The minus or plus sign appended signifies that the degree of agglutination was somewhat less or somewhat greater than the symbol states.

This experiment illustrates the view that different cultures of the same strain of this species show fluctuations of agglutinability as wide as those found in cultures of different strains.

TABLE II.

Cultures.	Sera.				Errors.			
Para. A.	S. 733	S. Ch. X	S. B.W.	Mean.	S. 733	S. Ch. X	S. B.W.	Mean
1	94	130	126	117	19·7	11·1	7·7	9·5
3	73	60	63	65	12·3	7·7	3·8	7·9
228	142	144	142	143	0·7	0·7	0·7	0·7
Cairo 1	162	183	150	165	1·9	10·9	9·1	7·3
335	200	140	175	172	16·3	18·6	1·7	12·2
Charing X	800	136	346	(422)	(90·0	64·0	18·1	57·7)
2	87	119	106	104	16·3	14·4	1·9	10·9
733	100	100	100	100	—	—	—	—
				Average	11·2	10·6	4·1	8·1

The figures given are the relative serum quantities required to agglutinate the various cultures to the same degree (2 hours' and 24 hours' readings averaged). They are therefore reciprocal to the relative agglutinabilities of the cultures.

* It was observed long ago by Dreyer and Jex-Blake (1905)[5] and Dreyer and Douglas (1910)[6] that an improvement in the accuracy of comparative readings was obtained by a second reading of their tubes after some 18–24 hours at room temperature. They worked, naturally, with suspensions of good quality, which do not need a prolonged incubation period to attain maximal flocculation.

TABLE III.

Five sera with four cultures (single tests).

Cultures.	Sera.				
	Para. A 2.	Para. A (B.W.).	Para. A 335.	Para. A Charing X.	Para. A 733.
A 733 ...	100	100	100	100	100
A 228 ...	135	130	105	145	133
A C1 ...	147	139	141	167	141
A 335 ...	—	175	88	141	135

The figures represent the reciprocals of the relative agglutinabilities of the four cultures with each serum. A 733 (a stock standard suspension) taken as unity in every case. Two hours' readings only.

TABLE IV.

Time in water-bath.	Serum A 41.		Serum A 29.	
	Cult. A 14.	Cult. A 29.	Cult. A 14.	Cult. A 29.
1 hr.	100	133	100	91
3 hrs. 40 m. ...	100	79	100	69
6 ,, ...	100	76	100	66
23 ,, ...	100	67	100	54

The figures represent the relative quantities of serum required to give a trace of agglutination. The table shows that Cult. A 29 has a slow flocculation-rate with both sera, compared with Cult. A 14. There is an indication of a slight acceleration by its own serum in the first hour.

TABLE V.

To show the slow rate of flocculation of a bad para. A culture.

Time in water-bath.	Cultures.	
	Para. A 27.	Para. A 34.
3 hours	100	417
5½ ,, ...	100	180
10 ,, ...	100	135
24 ,, ...	100	122

Para. 27 is a good culture; para. A 34 a bad one. Figures represent the relative quantities of serum required to give a trace of agglutination.

TABLE VI.

Serum A.				Serum B.			
Incubation time.	Quantities of serum.		Ratio.	Incubation time.	Quantities of serum.		Ratio.
	Cult. A.	Cult. B.			Cult. A.	Cult. B.	
½ hr.	0·600	>1·00	>1·67	½ hr.	0·640	0·800	1·25
1½ hrs.	0·200	0·275	1·38	1½ hrs.	0·300	0·263	0·88
6½ ,,	0·150	0·145	0·97	6½ ,,	0·245	0·187	0·76
24 ,,	0·140	0·100	0·71	24 ,,	0·200	0·140	0·70

Serum A and culture A = Oxford Standard para. A culture No. 27 and homologous serum (strain para. A 733). Serum B and culture B = serum and formalised suspension made with strain para. A 335. The reading given in every case is that of the finest trace of agglutination observable.

TABLE VII.

Serum O.				Serum Ch. X.			
Incubation time.	Quantities of serum.		Ratio.	Incubation time.	Quantities of serum.		Ratio.
	Cult. O.	Cult. Ch. X.			Cult. O.	Cult. Ch. X.	
2 hrs.	0·40	>1·00	>2·50	2 hrs.	0·30	0·35	1·17
4½ ,,	0·30	0·45	1·50	5 ,,	0·29	0·20	0·69
				7 ,,	0·25	0·16	0·64
22 ,,	0·25	0·15	0·60	22 ,,	0·22	0·13	0·59

Serum O and culture O = Oxford Standard para. A culture No. 27 and homologous serum (strain para. A 733). Serum Ch. X and culture Ch. X = serum and formalised suspension made with strain para. A Ch. X. In every case the reading is that of the finest trace of agglutination observable.

It must be noted that trace-readings only are used in the comparison. Coarser readings would give different ratios at all stages, and by their means it would not be possible to judge the true agglutinability of the bad culture, for it is only the agglutinability of its most sensitive bacilli that can be properly estimated. This being so, it is easy to see how different observers may arrive at different ratios of agglutinability when working with inferior suspensions. The culture para. A 34, though intended for a standard agglutinable culture, was withheld from issue by the Standards Laboratory on account of its bad quality.

Variations in Behaviour of Different Specific Serums.

Before entering further into the question of reaction-time some observations must be made concerning certain variations that occur in the behaviour of any pair of para. A suspensions when acted on by a number of different specific sera. Without assuming to lay down any rules of universal validity, I will state shortly the opinions to which experience has led me.

(1) A pair of good suspensions will give an almost, but not quite, identical ratio of agglutinability with all specimens of specific serum.

(2) The small differences of ratio are real and permanent, reproducing themselves constantly when the same pair of cultures are re-tested with the same serums after a year or more.

(3) The worse the quality of the culture the more pronounced do these differences become.

(4) A bad culture shows during the early hours of incubation a relatively greater sensitiveness when tested with its homologous serum than with heterologous sera. Possibly all cultures show this to some degree. Heterologous sera vary in their effects on a bad culture. Some agglutinate it more rapidly than others.

The special effect of homologous serum can be explained as an increase in the velocity of flocculation, which may perhaps mean that a larger number of elements is capable of being flocculated readily by this serum than by other sera. If a special term be needed as a label for it I suggest "super-specific acceleration."

This phenomenon must be taken into account in the interpretation of cross-agglutination and absorption tests on different strains of a species. So far as my experience with the "enteric group" goes, it is only one of several dimly understood phenomena, each of which may in certain circumstances lead our judgment astray. "Super-specific acceleration" seems to be important only when poor suspensions are in use. There is, indeed, a body of opinion that accuses agglutinin reactions of tending sometimes to give rise to unreal subdivisions of bacterial entities,[7] and we must assuredly adopt a rigidly sceptical attitude in interpreting our experimental results. Tables VI. and VII. provide good examples, similar to that in Table V., of agglutination tests which could not fail to be misinterpreted if a short-period reading were the only one taken. In each of these experiments a bad culture was measured against a good one, using first the serum homologous to the one culture and then the serum homologous to the other. In both alike the ultimate ratio of agglutinability after long incubation is identical. In both alike the bad culture has the slower flocculation velocity, and in both its velocity is very much higher with homologous than with heterologous serum. The bad culture C.X in Table VII. is the culture para. A Charing X of Table II. So imperfect was the flocculation of this suspension that even the strongest serum dilutions caused only partial agglutination. Attention was called to it as the only culture which showed such serious fluctuations with the different sera as to throw doubt upon its identity with the rest of the strains.

We are now in a position to form a truer judgment. Table VII. shows clearly how variable may be the ratios found unless prolonged incubation is carried out; but that, when it is carried out, the two ultimate ratios are the same.

It is easy to imagine that, with a suspension even more refractory than this one, one might fail altogether to reach the real end-point when using any but the strictly homologous serum. A precisely similar experiment is given in Table VI. Here the bad culture is para. A 335, which was seen in Table II. to show a degree of variability greater than any save para. A Charing X.

In the present table it manifests a variation similar in direction but inferior in magnitude to that of para. A Ch.X in the last table. Even when a pair of suspensions of the same strain are tested in this way first with a serum made with the one suspension, and then with a serum made with the other, there seems to be a tendency to this super-specifically elective action, but I have not made any sufficient experimental examination of this point.

Whether or no it can all be explained by reaction-time phenomena, there is no doubt that the ratio of agglutinability of any pair of suspensions may show definite and constant differences of a minor degree when the cultures are agglutinated by different sera.

The available evidence does not point to strain specificity as the true explanation of these minor differences, but rather to the interaction of other chemical or physical properties of the sera and the suspension, properties which must always

vary to a certain degree. The matter is, however, of sufficient importance to warrant a special investigation.

My thanks are due to Professor Dreyer for various suggestions, and to Miss J. Jorgensen for help in some of the experiments.

Summary.

1. Evidence is brought forward of the serological uniformity of a number of strains of *B. paratyphosus A* of widely different origins.

2. This constitutes prima facie evidence of the serological uniformity of the species.

3. Certain irregularities in the behaviour of some of the cultures are shown to be due to the variable rate of flocculation of inferior suspensions.

4. The greater sensitiveness of certain cultures to homologous strain sera is shown to be at least partly a reaction-time phenomenon, for which the term "super-specific acceleration" is suggested.

References to Part II.—1. Medical Research Committee's Special Report, Series No. 48, 1920, Part I. 2. Dreyer, G., and Inman, A.C.: THE LANCET, July 31st, 1915. 3. Topley and Platts: THE LANCET, 1918, i., 800. 4. Hort, E. C.: Jour. of Hyg., vol. xviii., No. 4, p. 361, 1920. 5. Dreyer and Jex-Blake: D. Kgl. Danske Vidensk. Selsk. Skrifter, 7, Raekke Afd., April 1st, 1905, and Jour. of Path. and Bact., 1906, p. 1. 6. Dreyer and Douglas: Jour. of Path. and Bact., 1910; Proc. Roy. Soc., B., vol. lxxxii. 7. E.g., Tulloch, re *B. tetani* in Medical Research Committee's Special Report, Series No. 39.

Clinical Notes:

MEDICAL, SURGICAL, OBSTETRICAL, AND THERAPEUTICAL.

A CASE OF

CESSATION OF RESPIRATION

FIFTEEN HOURS BEFORE DEATH.

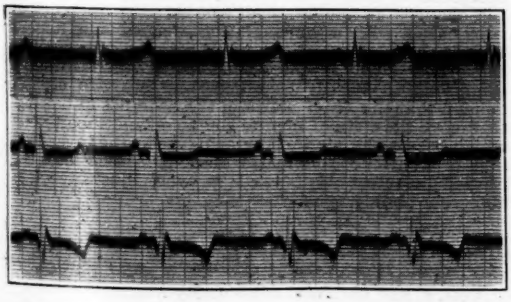
BY H. WALLACE JONES, M.Sc., M.D. LIVERP.,

HONORARY ASSISTANT PHYSICIAN, LIVERPOOL ROYAL INFIRMARY.

THE chief interest of the following case of cerebral hæmorrhage lies in the length of time during which the heart went on beating after spontaneous respiration had ceased and in the opportunity afforded of obtaining an electrocardiograph of the heart.

A married woman, aged 50, was brought to the Royal Infirmary unconscious and cyanosed with the history that she had suddenly become dizzy and fallen to the ground.

On admission she was markedly cyanosed and respiration had ceased. Her heart, however, was beating regularly and with considerable force at the rate of 120 per minute. Corneal reflexes were absent and no knee-jerks could be elicited. The pupils were equal and widely dilated.



Electrocardiogram taken in a case of cerebral hæmorrhage 12 hours after spontaneous respiration ceased. The vertical lines denote fifths of a second.

Artificial respiration was commenced at once and her colour rapidly became normal, the pulse-rate falling from 120 to 72 per minute; this was continued for two hours, during which time she made no respiratory effort.

It was then decided to use intratracheal insufflation of air, using Mr. R. E. Kelly's apparatus, which kept the patient's colour normal, the heart continuing to beat strongly as before. Lumbar puncture revealed normal cerebro-spinal fluid under slightly increased tension; the optic discs were normal, and the urine contained a slight trace of albumin but no casts. A surgical colleague was consulted with a view to performing a decompression, but as there were no localising signs it was not thought to be justifiable. The insufflation was continued until the heart ceased to beat, 15 hours after admission.

The accompanying electrocardiograph was taken 12 hours after spontaneous respiration had ceased, and shows normal rhythm with some lengthening of the ventricular complex, which occasionally exceeds half a second in duration. Post-mortem examination showed a recent hæmorrhage in the right cerebral hemisphere destroying the internal capsule; both the lateral ventricles were filled with blood, and there was some flattening of the convolutions. The medulla and pons were normal; signs of general arterio-sclerosis and chronic interstitial nephritis were present.

NOTE ON A CASE OF

PRIMARY DIFFUSE ALVEOLAR CARCINOMA OF THE LUNG.

BY A. KNYVETT GORDON, M.B. CANTAB.

A SPECIMEN, consisting of a portion of the upper lobe of the right lung, was sent to me for investigation by Dr. C. L. Lander, of Devonport, to whom I am indebted for the clinical notes of the case.

The patient, a woman aged 56, was well until four months before her death. The illness began with cough and dyspnœa, with very little expectoration and no hæmoptysis; she grew steadily worse, and took to her bed two months later. During the last month of her illness she suffered from severe attacks of dyspnœa with pallor, sweating, and rapid pulse. The physical signs were those of consolidation of the right lung.

Post mortem the whole of the right lung except the inferior portion of the lower lobe was infiltrated with a homogeneous mass of growth, the pleura being adherent and thickened throughout. There was no sign of disease in any other organ, nor were there any obvious metastases; the bones, however, except the clavicles, were not examined.

Macroscopically, the specimen exactly resembled a portion of lung in the grey hepatisation stage of lobar pneumonia. It was homogeneous throughout, and there were no signs of cavitation or breaking down of tissue.

On microscopic examination the alveolar structure of the lung was seen to be well preserved, but each alveolus was filled with a papillomatous collection of columnar epithelial cells arranged on a delicate fibrous support of a dendritic structure, bearing, in fact, a striking resemblance to a miniature villous papilloma of the bladder. Beyond slight post-mortem changes there was no gross or localised necrosis. The bronchi were unaffected, and there was no evidence of concomitant tuberculosis. The pleura was thickened by chronic inflammatory change, and adherent.

The interest of the specimen lies in its rarity. Primary carcinomata of the lung are said to form about 1 per cent. of all carcinomata, and of these the great majority are of the squamous- or spheroidal-celled variety, arising either from the bronchial mucosa or glands. The alveolar carcinomata are again divided into the nodular and diffuse varieties, of which the nodular is the more common. The type represented by this specimen is therefore almost a pathological curiosity. In view, however, of the clinical and pathological similarity between this type of alveolar carcinoma and lobar or lobular pneumonia it is possible that the disease may not be so uncommon as appears.

Bedford-square, W.C.

A CASE OF

CONGENITAL SUPRAPUBIC HERNIA.

BY F. M. NEILD, M.B., B.S. LOND.

WHILE examining coolies for the Chinese Labour Corps at Tsingtau in the spring of 1917 I came across a number of deformities and abnormalities. Among them was a case of suprapubic hernia of a type I have not seen described, though two cases of suprapubic hernia due to divarication of the recti have been published.

As the coolie presented himself for examination a rounded swelling about the size of a grape-fruit could be seen above and overhanging the pubes. On examination this proved to be a hernia with very thin coverings. The whole could easily be reduced and inverted within the abdominal cavity. The opening easily admitted the whole hand, and the entire pelvis could be explored. Above, the ring was arched and on each side attached below to the symphysis pubis. The edges felt sharp and were quite unyielding. The lower and narrower boundary was formed by the os pubis. The penis, scrotum, and inguinal canals were normal

and the coolie was otherwise well developed. He stated that he had had the hernia all his life, that it did not tend to get any bigger, and did not interfere with his work. There were no urinary symptoms.

For lack of time I was not able to make a more detailed examination. The possibility struck me that it was due to absence of the lower ends of the recti and pyramidales muscles.

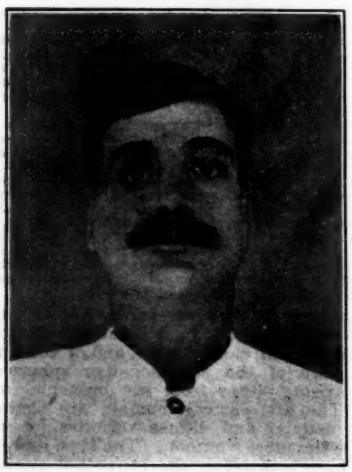
Shanghai.

A CASE OF MIKULICZ'S DISEASE.

BY S. G. ASKEY, M.A., M.D., B.CH. CANTAB.

THE patient whose photograph is reproduced was 28 years of age, and came under my care in India with chronic amœbic dysentery. The parotid glands were greatly enlarged, of uniformly tough consistency, and not tender. The lacrymal glands were about twice their normal size. There was also some enlargement of the submaxillary and sublingual glands. The man stated that he had noticed his face gradually increasing in width for about three years. The thyroid was not enlarged, the spleen was not palpable, and the lymphatic glands of the axillæ and groins were not increased in size.

The literature of the disease is meagre and chiefly continental. Mikulicz observed the condition in 1888 and first described it in 1892. The ætiology is unknown,



Mikulicz's disease, showing glandular enlargement.

and the disease has been variously ascribed to (1) a general infection; (2) a local infection; (3) a primary neoplasmosis. Histologically the enlarged glands show some of the appearances of sarcoma, but though slowly progressive the enlargement is in no sense malignant. I have seen one case of 15 years' duration. Pressure from the enlarged lacrymal glands sometimes causes impairment of vision, and the eyeball may be displaced downwards and inwards. The glandular enlargement is said to subside during an acute intercurrent illness, or after removal of the main portion of the lacrymal glands. A number of drugs have been recommended for the treatment of the disease—arsenic, iodides, sodium cacodylate, pilocarpin, Coley's fluid, thyroid extract, and X rays have been tried, but without much effect. It is interesting to note that most of the cases described have occurred in coloured persons.

References.—Mikulicz, J.: Ueber eine eigenartige symmetrische Erkrankung der Thränen- und Mundspeicheldrüsen, Beit. z. Chir. Festschr., Theodor Billroth, Stuttg., 1892, 610-630. Posey: Trans. Col. Phys., Philadelphia, 1916, third series, vol. xxxviii., 345. Pooley, G. H., Paton, L., Elliot: Proc. Roy. Soc. of Med., 1916, vol. ix., part iii.

Highgate.

Reviews and Notices of Books.

RHEUMATISM AND ARTHRITIS.

By RALPH STOCKMAN, M.D., Professor of Materia Medica and Therapeutics in the University of Glasgow, and Physician to the Western Infirmary, Glasgow. Edinburgh: W. Green and Sons, Ltd. 1920. Pp. 132. 15*s*.

So many gaps exist in our knowledge of the so-called "rheumatic diseases" of joints that insuperable obstacles bar the way to anything approaching finality in the description and classification of these disorders. The exact clinical differentiation of several of the members of the group is still scarcely possible, and the inherent difficulties of the whole subject are added to by the confusion among authors as to nomenclature and morbid anatomy of these diseases. The present writer has largely confined himself to recording the results of his own clinical and pathological observations and theorising has been sparingly embarked upon. Historical notes are appended to the description of the various disorders and these go far to clear up the confusion of nomenclature to which we have already referred. Indeed, we think the author has rendered a signal service to the serious student by their inclusion. The term fibrositis is used by the author as synonymous with chronic rheumatism—that is, chronic inflammation of the white fibrous tissue of the body. Chronic inflammation of the areolar tissue of the panniculus adiposus is referred to as panniculitis. The morbid anatomy and causation of this condition do not differ in essentials from what is found in fibrositis, with which it may coexist. A short chapter is devoted to Dupuytren's contraction of the palmar aponeurosis, and "claw-foot" is regarded as an analogous state. A lengthy chapter is set apart for the consideration of chronic non-suppurative arthritis, under which term the author includes rheumatoid arthritis and several ill-defined conditions which at present can only be differentiated from one another to a very limited extent, and which are collectively referred to as chronic infectious arthritis. This is followed by chapters dealing with purpura rheumatica, gonorrhœal rheumatism, arthritis of known causation—e.g., pneumococcic arthritis—and osteo-arthritis. Heberden's nodes have an interesting chapter devoted to their consideration. They are described as the result of a periostitis and osteitis rather than of osteo-arthritis. It is noteworthy that while all writers subsequent to Heberden describe the condition as a mild form of osteo-arthritis, yet Dr. Stockman in examining specimens has never met with the changes characteristic of true osteo-arthritis. The book closes with a consideration of coxa vara, hypertrophic osteo-arthropathy, and of nervous arthropathy. Little new light is thrown on the treatment of the conditions so lucidly described, and we are of the opinion that the chief merit of the book lies in helping to remove the state of mental confusion and incertitude which besets the student entering upon the investigation of "chronic rheumatic disease." The book is printed in clear type and is well illustrated by numerous photographs.

OPERATIVE SURGERY.

A companion volume to a "Manual of Surgery," Vols. I. and II. Third edition. By ALEXIS THOMSON, F.R.C.S. Edin., and ALEXANDER MILES, F.R.C.S. Edin. London: Henry Frowde and Hodder and Stoughton. 1920. Pp. 619. 16*s*. net.

THIS text-book of operative surgery, of which a new edition has been published, is well known and has long been valued. The text has been largely rewritten and rearranged, and matter has been added on some subjects which have undergone recent developments, such as artificial limbs and blood transfusion. A brief account of the main points in surgical anatomy has also been added. Although the number of the pages

has not been increased, a considerably larger amount of text has been printed on each page. Nevertheless, it is not possible in 600 pages to give a detailed description of most of the operations. Important operations are, indeed, barely mentioned, and in many cases the beginner using this book as his sole guide could hardly carry out with success the operations described.

The book is evidently intended for students who are acquiring an elementary general knowledge of surgical procedure rather than for those who are themselves engaged in the practice of operative surgery. With this fact in view we are less inclined to criticise its plan than we should otherwise be. Nevertheless, even though the student may acquire from the book a standard of knowledge adequate for the ordinary examinations in surgery, we regard it as unfortunate that it has not been brought thoroughly abreast of advances in surgical procedure. To take an instance. In the remarks on the technique of nerve suture, in which nerve-grafts and nerve-bridging operations are apparently considered quite satisfactory, a wrapping round the site of the suture seems to be regarded as essential, and no mention is made of the importance of preserving a small interval between the ends inside the sheath. In these points the authors run counter to recent teaching. Again, among the brief remarks on bone-grafting, no reference is made to Albee's "sliding graft," which is rapidly coming to the fore as the operation of choice in many cases, instead of plating or wiring. In the description of skin-grafting the free graft of the whole skin thickness, as distinguished from the pedicled graft, and various essential details of technique are not mentioned. After reading the authors' account of the time-honoured operations for placing an imperfectly descended testicle in the scrotum any student might suppose that they were found satisfactory in practice, whereas in fact they almost invariably fail. The only operation which does give some measure of success—namely, passing the testicle through the scrotal septum—is not mentioned. Syme's amputation of the foot is still described in the classical manner in spite of the fact that evidence accumulated during the last six years shows that a much higher section through the tibia and fibula gives better after-results.

Such instances might be multiplied. It is shortcomings of this kind, far too familiar in text-books of repute, that make the student distrustful, for he is taught in this way opinions and procedures which have long been modified or discarded in practice.

QUATRE LEÇONS SUR LES SÉCRÉTIONS INTERNES.

Par E. GLEY, Professeur au Collège de France; Membre de l'Académie de Médecine. Paris: J. B. Baillière et Fils. 1920. Pp. 160. Fr. 6.

THESE four lectures were originally delivered in Barcelona before the Société de Biologie in December, 1917. In compiling the present brochure certain additions to our knowledge of secretion of more recent date than the lectures, as well as a bibliography, have been added. The lectures do not claim to give an exposition or even a summary of the chief facts relating to the endocrine organs; they rather concern themselves with the method to be followed in researches on these organs and with the laws governing their mode of action—that is to say, the subject is approached from the physiological rather than from the medical point of view. The first lecture presents a critical exposition of the theory of internal secretion. The second examines the question as to what the essential function is which must be fulfilled before a gland can be regarded rightly as an endocrine organ. The third criticises the methods which too often have been employed in the past, and indicates the rational procedures which alone should be used in the study of internal secretion. The fourth lecture summarises the results which have been obtained up to the present time, and discusses their biological significance. The conclusion reached is that, despite mistakes of research in the past, the new ideas springing from the facts already obtained constitute a veritable revolution in biological knowledge.

A TEXT-BOOK OF PATHOLOGY.

Delafield and Prudden's Text-Book of Pathology. Revised by FRANCIS CARTER WOOD, M.D. Eleventh edition. London: John Bale, Sons, and Danielsson, Ltd. 1920. With 15 plates and 809 illustrations in the text. Pp. 1354. £3 3s.

IT is becoming increasingly difficult to present the facts and theories of general and special pathology in a single volume; indeed, the task can only be accomplished by a process of rigorous pruning, and the attempt to include methods of technique is calculated to jeopardise its success.

In the eleventh edition of this well-known text-book the original plan has been adhered to, and the section dealing with the methods of making post-mortem examinations and with the preparation and examination of pathological tissues has been retained, though the hundred or more pages thus occupied might have been liberated with advantage for use in other sections. This adherence to tradition is, we think, regrettable, and the numerous references in the text to "the scope of this book" seem to show that the editor is conscious of the limitations which he has imposed upon himself. Certain important processes undoubtedly receive less attention than they merit. The description of œdema, for example, is very brief, and it is surely within the scope of any text-book of pathology to discuss the formation of anæmic and hæmorrhagic infarcts. On the whole, however, the necessary compression has been carried out wisely and well, and the text has been supplemented by copious references to the literature.

For this edition the text has been carefully revised and several of the chapters have been practically rewritten. Many excellent illustrations have been added, and we are confident that the work will continue to enjoy its justifiable popularity.

AMERICAN POCKET MEDICAL DICTIONARY.

Eleventh edition. Edited by W. A. NEWMAN DORLAND, A.M., M.D. London and Philadelphia: W. B. Saunders Company. 1919. Pp. 771. 7s. 6d.

THE last edition of this admirable desk companion contains several hundred new terms and bears evidence of careful revision. The preface states that the total sales to date of the pocket dictionary, since its first appearance in 1898, have amounted to over 185,000 copies. Suggestions and lists of new words sent by readers have been freely used in revision. Besides the strictly alphabetical arrangement, the dictionary contains 75 tables in which correlated facts are grouped. The only questionable feature is the table of doses (both for man and beast) in the metric system, given to three or more places of decimals, and well calculated to put the aspirant off the metric system for life—e.g., the dose of osmic acid is given as 0·00108 g. This is doubtless the correct mathematical equivalent of $\frac{1}{60}$ gr., but in practice the last two figures have no significance whatever. We appeal to the editor to use his vast circulation to popularise a rational use of the metric system.

THE DOCTOR'S MANUAL.

Or Practitioner's Vade-Mecum. With which is incorporated "How to Cut the Drug Bill." By A. HERBERT HART, M.S. London: John Bale, Sons, and Danielsson, Ltd. 1920. Pp. 256. 10s. 6d.

THIS is the fourth, or as the author puts it post-bellum, edition of a volume which has proved of value to the medical practitioner in its earlier forms. Dr. Hart is not one of those moderns who has no use for galenicals; he is a believer in the value of simple old-fashioned mixtures, and he tabulates with commendable detail a hundred or so of prescriptions which he has himself found useful in practice, grouping them under code letters for ease of reference and remembrance. This list forms the bulk of the first or older part of the book. The second part contains short practical chapters on anæsthetics, antipyretics, antiseptics, spas and mineral waters, invalid foods, and biological therapy. There is no attempt at scientific treatment, but the

practitioner will find useful practical details of where to obtain and how to use. The third part is an alphabetical synopsis of treatment which the author must have intended to be suggestive rather than complete. Mr. Frank Kidd, whose portrait is placed by the author on the title-page, contributes a special article on Venereal Disease, terse and to the point. The appendix contains a curious but quite serviceable assortment of tables for the practitioner's reference.

THE EXTRA PHARMACOPŒIA.

Seventeenth edition, in two volumes. Vol. I. Revised by W. HARRISON MARTINDALE, Ph.D., Ph.Ch., F.C.S.; and W. WYNN WESTCOTT, M.B. Lond., D.P.H. London: H. K. Lewis and Co., Ltd. 1920. Pp. 1115 + xl. 27*s*.

A NEW edition of Martindale and Westcott's well-known and widely appreciated Extra Pharmacopœia is welcome. It is five years since the last edition (sixteenth) was published, many innovations have occurred since, and these are here comprehensively and faithfully dealt with. The work is a storehouse of accurate information and reference of value to medical practitioner and pharmacist alike. The former will note paragraphs dealing with the organic arsenic and antimony compounds, new coal-tar derivatives such as acriflavine and proflavine, the colloidal metals and non-metals, emetine, thorium compounds, and the vitamines. The latter will find an instructive and practical account of the manufacture of organic chemicals previously produced abroad. The successful preparation of these chemicals should, the authors hold, become more a matter of common knowledge. Many substances of admitted therapeutic value are the subjects of expired British patents, while their exact methods of production and their formulæ are uncertain. The Extra Pharmacopœia contains helpful information on these points, which should enable the qualified reader to obtain a satisfactory product by equally satisfactory procedure. The list of drugs coming within this category dealt with in the book seems exhaustive. There are chapters on vaccines; the authors set out the evidence in favour of the detoxicated vaccines. Throughout the whole work there is conspicuous evidence not only of thoroughness in actual compilation, but of personal investigation into many questions of importance in modern therapeutics. The Extra Pharmacopœia is not a text-book of pharmacology; it is not a critical digest of clinical experience. It does not set out to be either of these things; but within its limits, and with its records of pharmacological experiences, it is a book which the sister professions of medicine, pharmacy, and chemistry will consult with reward and advantage. Vol. II., to be issued later, deals with experimental work connected with the assay of chemicals and drugs, and contains sections on the composition of proprietary medicines, mineral waters, iontophoresis, radiology, with the addition of bacteriological and clinical notes. The Extra Pharmacopœia is one of the few books which medical practitioner, analyst, and pharmacist cannot afford to be without.

A SCIENTIFIC EXPLANATION OF CHRISTIAN SCIENCE.

By MICHAEL B. SHIPSEY, M.B., B.Ch. Birm. Birmingham: Cornish Brothers, Ltd. 1920. Pp. 23. 9*d*. net.

EVERY medical man knows that given two patients suffering from, say, pneumonia, the one who makes up his mind that he is going to recover will, cæteris paribus, be more likely to do so than the other who makes up his mind that he is going to die. In a way this is the principle upon which Christian Science goes, and thus far its doctrine may be sound. Dr. Shipsey has endeavoured to put the facts upon a scientific basis. Shortly, his thesis is as follows. Intense concentration of the mind upon anything is accompanied by a holding of the breath. Prayer is an intense concentration of the mind and equally a holding of the breath. In the case of a wounded or diseased part, the blood with its gases is forced by the guidance of the brain into the affected part, which thus gains an extra blood-supply together with an increased supply of nervous stimuli. There is nothing impossible here, but when Dr. Shipsey comes to physiological and psychical matters he seems to us to flounder dismally. For instance, he says "the mind is really the animal electricity residing in the entire body, and when you concentrate the 'mind' on any particular part of the body it means that an excessive amount of animal electricity is sent to that part. ..... When you look at an object in the distance a current of animal electricity (however feeble) passes to that object from the mind, setting up the process of vision in the brain." Again, "it has been well said that it is almost as hard to get a belief out of the human mind as it is to get the green colour out of a green leaf." Now nothing is more easy than "to get the green colour out of a green leaf," as any cook who has ever coloured food with spinach could tell Dr. Shipsey.

JOURNALS.

Quarterly Journal of Experimental Physiology. Editors: E. SHARPEY SCHAFER, W. D. HALLIBURTON, C. S. SHERRINGTON, E. H. STARLING, A. D. WALLER. London: Charles Griffin and Co., Ltd. 1920. Vol. XII., No. 4. Pp. 303-401. 10*s*.—The Histology of Tadpoles Fed with Thyroid, by R. K. S. Lim. Previous observers have determined that the feeding of larval amphibians on thyroid and other endocrine glands determines a precocious differentiation of the body, with suppressed further growth. Tadpoles of *Rana temporaria* were fed at various periods after hatching, the majority with water-extracts of both fresh and desiccated (sheep) materials and with some pond weed. Microscopic studies were made on several series of tadpoles at different ages, and it was found that the nearer the animal is to metamorphosis the more intense is the effect of the thyroid; moreover, the effect appears to vary directly with the dose. Microscopic study shows that thyroid "accelerates the ageing," the number of mitoses are increased and developed, and consequently metamorphosis is induced and hastened. All organs appear more "adult" in character. The alimentary canal is first to be affected, a large thin-walled larval type of intestine being réplaced by small, thick-walled type. Masses of pigment accumulate in the mucosa and may break through the epithelium. Thyroid-induced metamorphosis results in rapid absorption of the tail, the caudal muscles being disintegrated partly by phagocytes and partly by autolysis. The phagocytes loaded with muscle debris simulate eosinophil leucocytes, wander into the circulation and eventually are extruded through the intestinal mucosa. The number of blood corpuscles undergoing mitosis is increased. In general, normal processes are hastened and exaggerated by excess of thyroid hormones.—Observations on the Glycogen Content of Certain Invertebrates and Fishes, by L. G. Kilborn and J. J. R. Macleod. Using Pflüger's method for determining the amount of glycogen, it was found that the hepato-pancreas of representatives of asteroidea contained 0·23 to 1·52, lamellibranchs 0·31 to 1·56, crustacea 0·05 to 1·39, elasmobranchs none to 0·21, teleosteans none to 6·5, the amounts varying partly with feeding and partly with the season. As to muscles, lamellibranchs contained 0·07 to 2·67 (adductors), crustacea a trace to 0·36, elasmobranchs none to 0·02, teleosteans none to 0·29. The glycogen content of the heart was several times greater than that of other muscles, and sometimes greater than that of the liver—for example, in the lobster. There may be 0·85 to 1·42 per cent. in the heart as against a maximum of 0·36 per cent. in the muscles.—Observations on the Reducing Substance in the Circulating Fluids of Certain Invertebrates and Fishes, by R. S. Lang and J. J. R. Macleod. The body fluid of echinoderms and molluscs contains little or no reducing substance. In some crustacea there is only 0·04 to 0·08, and in certain others only minute traces or none. In the dog-fish none or only a trace was found, while in chimæra and carp the amount was similar to that of mammalian blood (0·071 to 0·145).—Researches on the Perfused Heart: its Mode of Working, by W. Burridge. The experiments were carried out on the hearts of *Rana temporaria* by methods and means already described by the author. The problem hangs round the salts of a special Ringer's solution. A heart so perfused may be likened to a machine working without lubricant, the normal lubricant being adrenin, which facilitates certain actions of calcium. Since blood contains adrenin and Ringer's solution does not the calcium tension of the solution must be higher than that of blood to compensate for the absence of adrenin. The fresh heart perfused with Ringer's solution beats at its maximum amplitude of contraction, but has a low order of "flexibility."—The Effect of Administration of Small Amounts of Thyroid Gland on the

Size and Weight of Certain Organs in the Male White Rat, by James Arthur Hewitt. In adult male rats administration of 0·1 g. or over of fresh thyroid per day causes hypertrophy of heart, liver, spleen, kidneys, suprarenals, and possibly the pituitary. The thyroid is diminished in size. The enlarged organs tend to resume normal proportions after resumption of ordinary diet.—The Influence of the Depressor Nerve on the Pulmonary Circulation, by E. Sharpey Schafer. That the pulmonary system is provided with vaso-motor nerves no longer admits of doubt, but differences of opinion exist as to their action on the circulation. The author's experiments were made on large rabbits anæsthetised with chloroform and under the influence of chloral. Excitation of the central end of the cut depressor nerve in the rabbit—vagi previously cut—produces dilatation not only of the systemic but also of the pulmonary arterioles, the latter effect being usually less pronounced than the former, though occasionally the reverse is observed. The depressor is singularly susceptible to mechanical stimulation, even gentle traction with a thread or the placing of the nerve on electrodes. During the inhibition of the systemic arterioles a large amount of blood is conveyed to the right side of the heart, and the same applies to the pulmonary arteries and the left side of the heart. In animals which, unlike the rabbit, do not possess a separate depressor but have depressor fibres included in the vagus, similar depressor effects are caused by stimulation of the central end of either vagus—both vagi being cut; but the results are apt to be complicated by other effects produced by stimulation of other afferent fibres in the vagus. Conspicuous Traube waves have been found sometimes to follow excitation of the depressor.—The Influence of the Respiratory Movements upon the Blood Pressure in the Pulmonary System, by E. Sharpey Schafer. By a special method described by the author the following, amongst other results, were obtained. Every inspiratory movement is accompanied by a fall of pulmonary blood pressure and every expiratory by a rise. These effects are purely mechanical and are due to increase in calibre of the pulmonary capillaries caused by inspiration and to their diminution by expiration. The changes of pressure in the aortic system caused by the respiratory movements are dependent upon those in the pulmonary system, but bear no constant ratio to them. Most frequently, however, the rise of aortic pressure is synchronous, or nearly so, with the inspiratory fall in pulmonary pressure, and a fall of aortic pressure synchronises with the expiratory rise. In the first stage of asphyxia inspiratory movements were found to increase in force, and expiratory movements to diminish—that is, the pulmonary pressure falls, whilst the aortic rises. In the second stage of accentuated expiratory movements the pulmonary pressure rises.—The other papers in this number are a Survey of Some Elements of Cardiac Excitability, by W. Burridge; Movements of Emotivity in a Japanese Subject, by A. D. Waller; and a Note on Cats with Double Vagotomy, by E. Sharpey Schafer. Two cats with double cervical vagotomy—one lived six months and the other four months, death being due to septic pneumonia, the result of the passage of food or vomit into the air-passages and lungs.

The Psychic Research Quarterly. London: Kegan Paul, Trench, Trübner and Co., Ltd. Vol. I., No. 1. 3*s.* 6*d.* net.—This new publication has been founded to supply the widespread demand for trustworthy information about psychical research, to counteract the inaccuracy and sensationalism of the lay press and the bias of the professedly spiritualistic journals. The first number certainly fulfils the editorial promise to give to its readers "every opportunity of forming their own opinions by publishing the best obtainable contributions to the problem from all sides." The first of these is an article on Scientific Method in Psychical Research, by Dr. F. C. S. Schiller, the well-known Oxford exponent of "Humanism." He points out that every problem of knowing is complicated by the presence of "bias," and that the topics of psychical research are peculiarly fitted to excite undue credulity or incredulity. From the point of view of science the existence of widespread bias hostile to psychical research has been the more important because it has led to the long neglect of this field of inquiry and to the scanty support which has been accorded to the pioneers who have tried to bring the methods of science to the solution of its problems. A plea is put forward for the endowment of psychical research; for here, as elsewhere, the secrets of nature are not to be wrested from her without much ardour and toil. Dr. Schiller believes that the only test that will be universally convincing in psychical research is the pragmatic test. It will be impossible to maintain an attitude of theoretic distrust if the beliefs arrived at can be applied to practical uses in the routine of everyday life. As an example of this he cites a document he once saw which greatly impressed him. It was a form of contract in which a firm of well-sinkers, who employed a "dowser," were prepared to find water in a supernormal manner on the basis of "No water, no pay."—On this topic of water-finding Sir William Barrett contributes a very interesting article, The So-called Divining (or Dowsing) Rod, in which he describes some instances of successful water-finding which might have justified such a contract as that referred to by Dr. Schiller.—The only article which has a clearly spiritistic flavour is one by Mr. J. Arthur Hill on Further Evidence of Supernormal and Possibly Discarnate Agency. He tells how he began his investigations as a sceptic of the school of Haeckel and Huxley, but was forced to become a believer by the accumulation of data of which a spiritistic explanation seemed the only reasonable and logical one. The evidence capable of being presented in a magazine article cannot be expected to convince anyone, but it may serve to direct interested readers to the fuller reports given in Mr. Hill's published works.—Miss Lily Dougall, writing on Faith and Superstition, maintains that science has no test for what may lie behind supernormal experiences, and seems to hold the questionable doctrine that we should attribute no objective reality to any intellectual conception which is out of harmony with our fundamental faith about the universe. She is inclined to believe, as do many of those who take a practical interest in psychical research, that the ultimate value of modern spiritualistic speculation is the extension of human knowledge as regards the powers and capacities of the subconscious, which appear to develop under trance conditions.—Dr. T. W. Mitchell writes on the relations between Psychopathology and Psychic Research. He discusses the nature of the trance-state and the source of the supernormal knowledge which sometimes appears to be manifested therein. He points out that, while we have no experimental parallel for the simple alternating type of double personality, we have in deep hypnosis a close parallel in many respects with the phenomenon of co-conscious personalities. The psycho-analysis of mediums might lead to useful results, but opportunities for such exploration would be very limited. Dr. Mitchell suggests that much popular misconception would be avoided if the distinction between the mechanism and the supernormal content of trance communication were clearly kept in mind, and indicates how psychopathology may throw light at least on the data available for the investigation of psychical research problems.—Mr. C. A. Richardson examines Immortality and the Survival of Bodily Death as Philosophic Problems in the light of the metaphysical hypothesis upheld by him in his recent work, "Spiritual Pluralism and Recent Philosophy." He points out that the problem of immortality is on an entirely different footing from that of the survival of bodily death. The latter can only be settled by a consideration of the empirical evidence, much of which he is disposed to accept. He considers specially important the evidence obtained from automatic script when the medium is not entranced, and thinks it points very markedly in the direction of survival. His reasons for ascribing so much importance to this particular class of evidence are not very cogent.

Tubercle. A Monthly Journal Devoted to all Aspects of Tuberculosis. Vol. I., No. 11. August, 1920.—This number opens with Some Thoughts on the Treatment of Pulmonary Tuberculosis, by Dr. Clive Riviere, who maintains that sanatoriums have not failed, and that the hygienic-dietetic, or rather the rest-and-exercise treatment does, in fact, constitute a cure of proven value. Failure is attributed to delay in diagnosis and defects in after-treatment, not to any inherent fault in the methods of the sanatorium. On the question of the utility of graduated labour, as distinguished from walking exercise, in treating patients who will return to sedentary life Dr. Riviere considers further investigation necessary before a final opinion is formed. A discussion on chemotherapy by metallic agents brings an interesting paper to a close.—The relation of pregnancy to tuberculosis and the indications for abortion form the subject of several book notices and abstracts, while a critical review deals with the incidence of tuberculosis among the first-born and later children. It is concluded that the evidence points to some unknown congenital factor as the cause of the greater susceptibility of the first-born in adult life.—Another interesting review discusses the remarkable difference said to have arisen between the American campaign against tuberculosis and our own, the former being concentrated on improving the soil, while the latter is directed mainly to limiting the spread of the seed. This radical divergence of authoritative opinion should warn us against urging drastic or costly measures until experiment has proved their value on a small scale.

GREAT NORTHERN CENTRAL HOSPITAL EXTENSION.—The designs of Messrs. H. Percy Adams, F.R.I.B.A., and Chas. H. Holden, A.R.I.B.A., have been selected for the proposed extension of the Great Northern Hospital, Holloway.

Reports and Analytical Records
FROM
THE LANCET LABORATORY.

(1) VACCINES; (2) ANTACID LOZENGES; AND (3) FECTO DISINFECTANT.

(PARKE, DAVIS, AND CO., BEAK-STREET, REGENT-STREET, LONDON, W.)

(1) A new series of vaccines introduced by the above firm and prepared under the control of the bacteriological authorities at St. Mary's Hospital calls for notice. First, is a diphtheria bacillus vaccine suggested for the treatment of diphtheria carriers and of convalescents from that disease; secondly, a mixed gonorrhœa vaccine prepared to meet the cases in which secondary infections arise; and, thirdly, an antirheumatic vaccine prepared from numerous strains of streptococci isolated from the mouth, intestinal and genito-urinary tract of patients suffering from rheumatism and rheumatoid arthritis. The suggestion is that such disorders follow streptococcal infections of these channels, and encouraging results are reported from the use of a mixed vaccine.

(2) We have confirmed the formula of these lozenges—bismuth carbonate and magnesium carbonate with essential oils of a well-known carminative kind. The combination is a good one, and the inclusion of taka-diastase, the activity of which in the hydrolysis of starch was shown in our examination, adds to its usefulness in dyspeptic troubles.

(3) Fecto, we find, is a clear, colourless solution of the alkaline hypochlorites, and the specimen submitted showed an available chlorine content of 4·6 per cent. It has a slight chlorinous odour, and its powerful disinfecting properties have been well established. Apart from surgical application, when suitably diluted (1 oz. to the gallon of water) it can be used generally and safely for domestic disinfecting and deodorising purposes.

(1) PERTONAL AND (2) BRUNOL.

(STRANGE AND GRAHAM, LIMITED, 50, CITY-ROAD, LONDON, E.C.)

(1) A contribution from the Pharmacological Laboratory, Cambridge, on pertonal, which is para-acetyl-amido-ethoxy-benzene, was published in the *Journal of Pharmacology and Experimental Therapeutics* of February, 1919, from which it appears that this substance possesses approximately one-half the toxicity of phenacetin, and as an antipyretic produces similar effects in doses approximately double those of phenacetin. It is reported also that the solubility of pertonal is 1 in 60, whereas that of phenacetin is only 1 in 1700, and while the latter synthetic exerts a directly depressant action on the heart, pertonal exerts a stimulation. According to these results the drug promises to prove a valuable analgesic, but further clinical evidence seems desirable as to its general effects. It is a white crystalline powder and shows a chemical composition related to phenacetin.

(2) Brunol is normal primary butyl salicylate, and the record of its application in the relief of burns is striking from the cases reported from Guy's Hospital. It is a highly refractive fluid immiscible with water, but yielding to that fluid some salicylic acid, as shown by the perchloride of iron test. In burns and scalds it is used as a dressing on lint. Whilst palliative and soothing, it is said to promote granulation and healing.

SEMPROLAX.

(THE WM. BROWNING CO., LTD., ALBERT WORKS, ALBERT-STREET, PARK-STREET, LONDON, N.W.)

The effectiveness of this emulsion is shown by the fact that, according to our examination, only 10 per cent. of the petroleum was directly extracted by petroleum ether. By subsequent chemical dislocation, however, we found present just short of 80 per cent. by volume of paraffinum liquidum of correct viscosity. The emulsion is, in fact, so perfect that it dilutes with water, still keeping its condition of emulsion. There is no separation of the hydrocarbon.

LECTONA.

(LECITHIN, LTD., RICKMANSWORTH-ROAD, WATFORD, HERTS.)

The claim made in regard to this preparation is that it contains lecithins and vitamines, and statements are made referring to the value of these substances. We have established in our analysis the presence of fatty substance which proved to contain phosphorus. It is a malted preparation, and, according to our results, contains 2·91 per cent. of fat. The fat extracted was yellow in colour and appeared to be of an egg origin. The food shows high protein value, equalling 8 per cent. of nitrogen. There are present also sugars derived from malt and milk. There was no starch present according to our examination.

GLAXO, NOS. 1 AND 2.

(GLAXO, 155-157, GREAT PORTLAND-STREET, LONDON, W.)

The introduction of two dried-milk products with an admitted reduction of fatty contents is of interest, inasmuch as some authorities on infant feeding take the view that a high percentage of fat in dried cow's milk causes disassimilation in certain delicate subjects. The samples submitted to us gave the following results: No. 1: fat, 14·40 per cent.; No. 2: fat, 19·60 per cent.—results which conform to the statements of the manufacturers. The reduction of fat in dried milk as here shown no doubt helps in preserving the product against getting rancid, which, it may be added, is a serious trouble with full-cream milk powder. Standard glaxo contains the whole of the cream and keeps well.

SKETOFAX.

(BURROUGHS, WELLCOME, AND CO., SNOW HILL BUILDINGS, LONDON, E.C.)

What is described as a new culicifuge has recently been introduced by the above firm. The preparation is founded on an oily basis resembling vaseline which is practically clear. It is contained conveniently in a collapsible tube. The composition has been well considered, and the essentials making it a sedative and a guard against the attack of malignant insects are of recognised value. It is useful to remember in this connexion that the sting of the wasp is alkaline, whereas that of the bee is acid.

CROFTOL.

(THE UNITED TURKEY RED CO., LTD., 46, WEST GEORGE-STREET, GLASGOW.)

This is a dark-brown, clear, syrupy fluid, containing, according to our analysis, a maximum of tar acids and a minimum of alkali to render them soluble. It mixes well with water, with a slight opalescence resulting. We found present 80 per cent. by volume of tar acids, and alkali equivalent to 4·4 per cent., expressed in terms of Na_2O. In view of the high proportion of tar acids it is not surprising to learn that the germicidal efficiency is high and 11 times that of carbolic acid itself. It shows an alkaline reaction, and when diluted as directed exhibits no corrosive action on the metal of surgical instruments.

SPASMALGIN (ROCHE).

(THE HOFFMANN-LA ROCHE CHEMICAL WORKS, LTD., BASLE; AND 7 AND 8, IDOL-LANE, LONDON, E.C.)

Spasmalgin is described as a combination of papaverine, omnopon, and atrinal, and is supplied in the form of tablets and solution for hypodermic injections, the administration of which, of course, is subject to the control of the physician. The chief claims for its pharmacological uses are that it is a soothing and sedative preparation in gastric pain, colic, and painful menstruation; in a word, an antispasmodic or analgesic. We are not aware that papaverine has been singled out as of special value, but the suggestion is of interest that as an alleviative it is without side-effects, aided by the complete constituents of opium (omnopon). Atrinal, a sulphonic derivative of atropine, is claimed to have a stimulating action on the respiratory centre, increasing not only the number but also the depth of respirations.

THE LANCET.

LONDON: SATURDAY, SEPTEMBER 4, 1920.

Modern Applied Physiology.

THE meeting of the British Association for the Advancement of Science at Cardiff last week was an agreed success, not so much in the numbers that attended as in the welcome revival of the opportunity of discussion in congress of scientific progress in many directions. Although regular meetings were suspended through the war period, it is evident from the papers read at the sessions this year that scientific thought was moving all the time even without the stimulating suggestion available at such gatherings. War, in fact, turned a search-light to bear on many pressing problems, revealing where research was needed before the comfort, convenience, and necessities of human life could be secured in a stable form. We may be excused for seeing the greatest progress along the lines of applied physiology, and in this direction many of the more important addresses pointed. We referred last week to Professor W. A. HERDMAN'S address from the presidential chair, in which he pointed out the advantage to be gained from placing the harvesting of the sea on less empirical lines by studying more closely the habits, movements, diet, and growth of fishes. Professor J. STANLEY GARDINER, in the Botanical Section, touched upon the same subject of human nutrition in relation to the intensive cultivation of food in the land. He showed how capacious is the market for home produce. If only one-fifth of these requirements could be produced at home, this would amount in value to over 20 million pounds, requiring the use of several hundred thousand acres of land and providing employment for 100,000 men.

The address of the President of the Physiological Section also dealt with physiology as applied to large masses of humanity. We print Mr. J. BARCROFT'S study of anoxæmia at the front of THE LANCET this week. Starting from what appears to be only a careful study of the gases of the human blood, particularly with regard to its oxygen content under varying environments, the plot develops from mountain climbing as a hobby to encompass the saving of countless lives risked in gas warfare and the safety and comfort of airmen, military and civilian. The lessons of gas warfare, and the entrancing history of the developments of counter measures are drawn also in an annotation in our present issue dealing with the work of the Royal Army Medical Corps. In the same section Dr. THOMAS LEWIS proposed to bring physiology still more closely home in the medical curriculum by turning the student's observation upon the human organism rather than upon the body of the lower animals. Although it was true that the largest part of our knowledge of human function was still derived by analogy from animal observation, he was concerned rather that students should, in the most impressionable period of their career, learn how to investigate the human body itself. Papers read in other sections bore on this thesis. Professor KARL PEARSON in his Presidential address to the Anthropological Section held that the pulse-tracing, the reaction-time, the mental age of the men under his control were far more important to the commanding officer, and indeed to the employer of labour, than any record of span, of head measurement, or of pigmentation categories. To-day psycho-physical and psycho-physiological characters were of greater weight in the struggle of nations than physique and stature. The experience of the war bore out the need for a new anthropology founded on psychometry. In his address to the Subsection of Psychology on the dreams of children who are physically defective, Dr. C. W. KIMMINS brought out the conclusion that these dreams differ from the normal in several instructive ways which have a practical bearing on educational method.

This is in barest outline the message of the British Association of 1920—a recognition of the application of the principles of physiology to the smallest speck of living matter and to the largest problems of human life. Cardiff itself afforded, however, during the session a curious instance that something still remains to be achieved in the application of orderly scientific method to human requirements. Electric power was there ready harnessed to man's use; all the apparatus of refuse destruction were to hand in working order. But traffic was stationary, and dirt accumulated in the streets from failure of the human element in the machinery. The applied physiology of industry is still in its infancy, and until it is better understood the application of much else will be liable to miss. A successful solution of the problem of industrial fatigue and the adaptation of industry to environment would tend greatly to the advancement of science, and form worthy subjects for the attention of the British Association.

Death Registration.

ALL is not well with the existing arrangements for recording the fact and the cause of death, matters of importance alike from a social and a scientific standpoint. The deputation from the British Medical Association and the Medical Parliamentary Committee, which waited recently[1] upon the Home Secretary and the Minister of Health, laid before them certain recommendations for the amendment of the law in these respects and in the manner of holding coroners' inquests. Other organisations are dissatisfied with the position. At the annual meeting in Birmingham of the Royal Sanitary Institute Alderman J. R. HURRY, honorary secretary to the British Undertakers' Association, commented on the dangerous defect of the present system in regard to the registration of stillborn children. The questions thus raised must be considered in the light of the report published by the Departmental Committee, over which Sir MACKENZIE CHALMERS presided in 1909. Death certification is closely bound up with the coroner's functions, and the two will have to be considered together when Parliament finds the opportunity, long overdue, of dealing with the recommendations of the Departmental Committee and the fresh points which have arisen during the ten years since its Report was issued.

Both the medical deputation and the undertakers' representative emphasise the importance of certain recommendations of the Committee. For example,

[1] THE LANCET, August 14th, p. 375.

a medical practitioner should have to state on his certificate that he has satisfied himself by personal inspection as to the fact of death; again, the absence of a medical certificate should invariably be reported to the coroner. The law as it stands offers every opportunity for premature burial and every facility for the concealment of crime. The case of those who urge amendment could hardly be put more strongly than it is thus put by the Departmental Committee. The deputation, however, breaks new ground in submitting a demand for a dual form of certificate: one part, certifying the fact of death, to be given to the relatives of the deceased, and the other certifying the cause of death, to be handed only to the proper authorities, presumably the Registrar. It is intended that the latter document should be treated confidentially, as the reason given for its use is that under the present system relatives are informed of details which it is not necessary, and at times very inadvisable, for them to know. This, the Home Secretary was informed, leads to the employment by the certifier of euphemisms which deprive the statistical returns of any real value. While the motive of the suggestion is sound enough, the proposal itself amounts to keeping surviving relatives in ignorance of the cause of death as certified. It is hardly likely that the thoughtful part of the public would sanction such an innovation, and we believe that practitioners themselves would sometimes find it prejudicial to their interests. The fact that there existed a secret certificate, possibly varying from the statement made to the family of the deceased, might well tend to diminish confidence and impair friendly relations. Parliament would require strong evidence of the advantages to be gained from this suggestion, and of the weight of medical opinion in its favour, before adopting it. The most drastic proposal of the deputation was to the effect that the coroner's functions as we are familiar with them should be done away with, and his duties restricted to determining the fact and nature of death, leaving the magistrates to carry on the inquiry where it was "proved to be a case for legal intervention." Mr. N. BISHOP HARMAN, the principal spokesman of the deputation, said that the legal side of the coroner's work seemed unnecessary and the publicity of his court undesirable, and Mr. E. B. TURNER, who supported him, referred to the inquest as a pseudo-trial, often conducted without due regard to the laws of evidence.

These are important matters which were not considered by the Departmental Committee of 1909. Probably a second Committee with an enlarged reference might usefully carry on the work of its predecessor as a preliminary to legislation, which should then be introduced without delay. Such a Committee would not necessarily take long to inquire and report, as a great deal of historical matter and questions not needing to be reopened were dealt with by its predecessor. It would have before it the evidence already given for comparison with that advanced in favour of the views of the deputation. It could recall witnesses heard before and ascertain whether they had changed their opinions in the years that have intervened. It could consider afresh questions of fees for medical witnesses and many other matters in the light of present-day conditions. The progress of scientific medicine will be seriously impeded unless these things are cleared up and cleared up promptly.

The Prevention of Tetanus.

THE Research Defence Society has done well in publishing an authoritative pamphlet[1] by Sir DAVID BRUCE on the prophylactic and curative use of antitetanic serum during the late war. The main object of the pamphlet is to place before the public in a clear and convincing manner some facts which may help to discount the machinations of antiscientific fanatics, and in this object Sir DAVID BRUCE will admirably succeed if his pamphlet obtains a wide enough circulation. The sequence of events in the growth of our knowledge concerning tetanus and its culmination in the wholesale use of antitetanic serum during the war, which finally reduced the incidence of tetanus to almost negligible proportions, form a particularly clear-cut demonstration of the value to mankind of the experimental inoculation of animals. Outside the numerically small circle of doctors and nurses few can have seen in his agony a man suffering from tetanus, and Sir DAVID BRUCE rightly insists on the appalling horror of the disease. It is demonstrably fair for defenders of research thus to call true sentiment to their aid.

The facts brought forward by Sir DAVID BRUCE have been published at various times in our columns and in broad outline at all events they are well known to every member of the medical profession. Many of those who served in the R.A.M.C. during the first months of the war had too many opportunities of gaining first-hand knowledge of the disease. Later, when the prophylactic routine for gunshot wounds had been established, these opportunities became rarer, though the slow realisation of the danger of tetanic infection from lesions so trivial as blistered or frozen feet maintained the incidence at a higher level than would otherwise have been the case. Thus there was a considerable recrudescence of the disease in the winter of 1916–1917, when the incidence rose to nearly 3 per 1000 casualties in the home hospitals. In June, 1917, the prophylactic routine was further extended, so that thereafter every casualty received four injections of serum at intervals of a week, and the incidence then never rose again as high as 2 per 1000, not even during the retreat in March, 1918, when external conditions greatly favoured an increase. During the heavy fighting in the last four months of the war the incidence remained below 1 per 1000—a striking contrast to the nine-fold figure registered in September, 1914.

Nevertheless, our memories are short, and it may be doubted whether even the medical profession has fully taken to heart all the lessons learnt during the war. Any prophylactic routine can be enforced with the help of military discipline, but in civilian life there is no such perfect coördination, and it is something of a reproach to medicine that prophylaxis against tetanus has not been more generally applied during the last two years. Tetanus is admittedly not a common disease in civil life, but it continues to occur in spite of our ability to make it almost unknown. Publicity was given recently in the columns of the *Times* to inquests held at Greenwich on one day into two cases which had died from tetanus at

[1] The Prevention of Tetanus during the Great War by the Use of Antitetanic Serum, by Major-General Sir David Bruce, K.C.B. F.R.S., Army Medical Service, Chairman of the War Office Committee for the Study of Tetanus, 1914–1918. London: Geo. Pulman and Sons, Ltd. Pp. 27. 1s.

different hospitals. No reference was made in the report to the use of prophylactic serum, and it is possible that in one case, in which a man had trodden on a nail protruding from a plank of wood, no medical advice was obtained until the symptoms of tetanus appeared. In the other case a boy had severely injured his finger in the iron grating of a street gully, and prophylactic serum should undoubtedly have been given. The preventive routine can and should be enforced by the authorities of every hospital as rigidly as it was in the army, and the attention of the Ministry of Health might be directed to the desirability of securing this. Meanwhile Sir DAVID BRUCE'S excellent pamphlet may serve to emphasise to the public and to the medical profession alike the great importance of efficient prophylaxis. To the latter it may also suggest the necessity for becoming familiar with the principles of the intensive treatment of the disease, when once established, by the intradural injection of the concentrated serum—a method in use during the last year of the war. Sir DAVID BRUCE admits that there has never been any uniformity of treatment; on general principles it is reasonable to suppose that so fatal a disease is best combated by the most drastic remedy.

Annotations.

"Ne quid nimis."

THE PERMANENT INTERNATIONAL HEALTH OFFICE.

WE recently noted with satisfaction the adoption by the Council of the League of Nations, lately held at San Sebastian, of the establishment of a permanent international health bureau as part of the organisation of the League. This will incorporate and supersede the International Office of Public Hygiene in Paris, set up under the Rome Convention of 1907, and usefully active within the limited scope of its constitution. Formal adoption of the enlarged scheme by all the nations in the League cannot take place until November, but there is no reason to doubt that the functions of the Health Office will be extended in the sense of the Council's recommendations. The permanent committee of the Health Office will advise the League in all matters affecting health. It will help to bring administrative health authorities throughout the world into closer relationship, and to secure international agreement on matters of health where common or standardised action by different Governments is needed. It will aim at organising rapid interchange of information in face of epidemics which demand immediate precautions. In dealing with the protection of the worker against sickness, disease, or occupational risk the permanent committee will coöperate with the International Labour Organisation in securing action; doubtless many opportunities will occur of conference and coöperation with the League of Red Cross Societies. One of the most practical functions of the permanent committee will be to organise missions on matters of health at the request of the League of Nations. This is a general outline only of the work of the International Health Office, which will not be limited by any cut-and-dried scheme. Its chief promoters have in view a useful and practical piece of health organisation. One of its first tasks might well be to adopt an international code of disease nomenclature, without which it is difficult for the nations of the world to communicate intelligibly on health affairs. If only international organisations had come into being at a time when Latin was still the medium of civilised intercourse it would have been easier.

GROWTH AND METAMORPHOSIS.

RECENT investigations have shown that not only growth but development and metamorphosis are gradually being brought within our control, and that all three phenomena may be modified in various ways and are probably due to different causes. The marvels of internal secretions and the mysteries of "interstitial glands" are frequently paraded in the lay press, while "growth vitamines" are beginning to be part of every man's general knowledge. There are some recent advances in these matters to which we wish to direct attention, more especially as to endocrine balance and certain special endocrine activities. Animals whose full development implies metamorphosis present problems different from those arising from the regular orderly growth of animals not undergoing metamorphosis. New factors come into play and require study and explanation. If to the ordinary food of frog-tadpoles or other larval amphibians, such as salamanders or the axolott, thyroid extract or thyroid tissue be added, it is known that the duration of the tadpole stage may be greatly shortened, even to one-fourth of the normal period. Frog-tadpoles under appropriate conditions may become frogs in three weeks instead of three or four months. This is not the realisation of an elixir vitæ, but the acceleration of "ageing" as described by Gundernatch in 1912—an "ageing" transformation since confirmed by many observers. The thyroid causes a precocious development of the body, but suppresses further growth. R. K. S. Lim, in a recent paper published in the *Quarterly Journal of Experimental Physiology* (see p. 504 of our present issue), has added to our more intimate knowledge of the histological changes that occur in thyroid-fed tadpoles of the common frog. The number of mitoses in tissues generally and blood cells is increased and the organs become more adult in character. Metamorphosis is accelerated, rapid absorption of the tail muscles occurs, and normal processes are hastened, so that a nine days' tadpole is histologically more adult than a non-treated tadpole of 20 days. Such is the speeding-up or "age-acceleration." The effects of the suppression of thyroid activity in larval amphibians by cauterisation or excision are the converse of those obtained by feeding with thyroid, the tadpoles being prevented from undergoing full metamorphosis. This stage cannot be regarded as an elysium of perpetual youth, for the victims are condemned to live on a lower platform of existence. If thyreoglobulin is hydrolised a mixture of iodised aromatic amino-acids—iodothyrin—is obtained; this has some thyroid-like activities, and so, according to Abderhalden, have artificial iodised proteins, biuret-free products obtained from thyroid substance. All of these possess accelerating action on the metamorphosis of tadpoles; certain iodine-free bodies are said to have such an action. According to Abderhalden, extract of thymus or adult thymus substance prevents metamorphosis but not growth, an action exactly opposite to that of thyroid. We know that the removal of the thymus in mammals arrests growth of the sexual glands, and the bones especially present appearances not unlike those occurring in rickets. E. Uhlenhuth, of the Rockefeller Institute, has carried the matter a stage farther, experimenting on two species of salamanders. According to him, metamorphosis of the larvæ into adult animals takes place only when the thyroid gland begins to excrete the thyroid hormone. Many larvæ with fully developed thyroid glands do not undergo metamorphosis, and since the follicles of their thyroids contain large quantities of "colloid" for a considerable time before metamorphosis, it is probable that the thyroid gland cannot begin to excrete its hormone unless a second factor is present in the larvæ. This factor, it seems, is elaborated during the process of growth, and must be present in a sufficient quantity in order that the thyroid function may begin. The greater the rate of growth the shorter is the length of the larval period. Metamorphosis thus depends not only upon the thyroid hormone, but also on a second substance the quantity of which increases in the same ratio as growth. This second substance must be present

in a certain quantity in order that metamorphosis may take place, and its rate of formation for the same kind of food and for the same rate of growth is distinctly influenced by two factors, the quantity of food and by the temperature. It is quite clear that we are a long way from a satisfactory explanation of the very far-reaching, varied, extensive, and pre-eminent influence of the internal secretion of the thyroid gland on growth development and general metabolism. Nor do we know much of the interdependence of that strange physiological triad—the thyroid, pituitary, and adrenal glands.

DR. COWLEY AND DR. CAWLEY.

SOME medical men are born poets, whereas few established poets are made doctors of medicine. A striking example of the latter select group is to be found in Abraham Cowley (1618–1667), of whose poetry and somewhat wistful charm there is a brief but polished appreciation in the September number of the *XIXth Century and After*, without, however, any suggestion that he belonged to the healing profession. This omission, if such it be, is natural enough, for he was created M.D. at Oxford on Dec. 2nd, 1657, by edict of the Government, in order, so his biographer Sprat considers, to serve as a blind for his real designs—namely, those of a Royalist agent. At any rate, it does not appear that he ever published anything medical, and he certainly should not be confused with Thomas Cawley, often incorrectly quoted in the literature as Cowley, who in 1778 by giving a careful account of a single case earned the credit of the first description of diabetes due to a pancreatic lesion. The case was one of chronic pancreatitis with numerous calculi not larger than a pea. Cowley was a scholar of Trinity College, Cambridge, where, about 1639, among other poems, he wrote an elegy on the death of his intimate friend, William Harvey, who must not be thought to be the discoverer of the circulation (1578–1657). Though if the dates are not kept in mind this error would be excusable, for Cowley was ejected from Cambridge in 1643 and took refuge at Oxford, where he might have come in contact with the King's physician who became Warden of Merton in 1645, and travelled much on behalf of the Royalists. He was also one of the original members of the Royal Society and composed an ode to it. Although, as H. H. Bellot says in the article we have mentioned, "at a precociously early age Cowley fell in love with the delights of simplicity and quiet" he had an unfair share of the alarms and excursions of civil war and of political intrigue. It is satisfactory to learn that he obtained a quiet retreat in the country, though only four years before his premature death, and there composed some essays modelled on Montaigne's. His confession, "I love Littleness in all things—a little convenient Estate, a little chearful House, a little Company, and a very little Feast," may remind the reader of Professor A. E. Boycott's attractively whimsical contribution to the Osler Volume, entitled "On the size of things, or the importance of being rather small."

DEFENCE AGAINST GAS WARFARE.

THE whole question of defence against gas warfare is instructively reviewed in an address by Lieutenant-Colonel P. S. Lelean, published in the June number of the *Journal of the Royal Army Medical Corps*.

It was, he says, on April 23rd, 1915, that London got the news of the first gas attack. The War Office at once made urgent demands on the R.A.M.C. for protection, and that these demands were met was due largely to the high scientific attainments and unfailing resource of Colonel Sir W. Horrocks. The gas first used was chlorine. Its menace was met with pads of cotton waste soaked in glycerine and hyposulphite of soda, sewn into muslin bands. It took time to plan, to obtain and assemble materials for these pads, and to organise their manufacture, but in 60 hours there were 98,000 at the front, in a week 300,000, and in a month 2,000,000. These pads would only neutralise gas for ten minutes, and a man could not work in them for long. The pad was replaced by a helmet made of cotton stuff. It was difficult to get suitable fabric and dyes; eyepieces had to be fitted and carbonate of soda had to be added to the "hypo." to deal with sulphurous acid, yet in three weeks 300,000 were issued, and the work was so well done that the next gas attack, which lasted four hours, did not cost us one life. But more complicated gases came later, and protection against every possible gas had to be provided. The best absorbent for each gas had to be found, and the gas was then tried through an impregnated helmet on a rat. The next experiment was made on a pig wearing a helmet, and if the pig survived one hour the gas was tried on one of the staff, wearing a helmet, in what was called "the lethal chamber." Scientists with dogged courage risked themselves in these dark chambers, became incapacitated, and returned to the adventure as resolute as ever. When the number of gases increased the number of absorbents had to be increased too. Sodium phenate was an effective absorbent for carbonyl chloride and hydrocyanic acid, but the first day helmets were dipped in this solution 200 women had their arms burnt, a horrid shock to the directors. Then it was found that the sodium phenate having absorbed the hydrocyanic acid, the compound became broken up by the carbonic acid of the breath and the rats died; so an exit valve had to be fitted to the helmet through which expired air must escape. Then hexamine (urotropin) was found by a Russian to clear the air of these gases, and for a time a ton a day of urotropin was made for this purpose. These helmets were on issue from July, 1915, to February, 1918, and in all 26,800,000 were made. Effective goggles, too, had to be invented as a defence against lacrymatory gas (benzoyl chloride). Not only men but horses also were protected. Indeed, one pig wore a helmet through a gas attack on Dec. 22nd, and was saved to appear at dinner on Christmas Day as roast pork. The helmets were insufficiently "polyvalent," so were replaced by the box respirator, in whose "tower" were half-a-dozen trays of various absorbents, separated by cellulose diaphragms, and including, in addition to "hypo." and soda, soda lime permanganate to deal with arseniuretted hydrogen (the soda lime permanganate in granules was invented by the late Lieutenant-Colonel E. F. Harrison after 48 inconclusive experiments), sodium sulphite against chlorpicrin, and animal charcoal. The box withstood six gases run through it in succession for one hour each. This respirator, though so complicated, took only 25 seconds to put on, and 16 millions were issued.

This very brief résumé of the address given by Colonel Lelean can hardly do more than call attention to it; those who read the original will be impressed with the urgent gravity of the calls made during the war on our resourceful scientists, and by the tremendous scale of the work that had to be undertaken at a moment's notice. Colonel Lelean remarks that Germany had ever boasted of her "better brains," but once they challenged our scientists squarely and thoroughly woke them up it was our men who won at every turn. He is to be congratulated on his clear and comprehensive account of this scientific victory, for which the army has indeed every reason to be grateful to the Royal Army Medical Corps. We may add that amongst those who with "dogged courage risked themselves in these dark chambers," and who "became incapacitated and returned to the adventure as resolute as ever," was an assistant from THE LANCET Laboratory. On regaining consciousness he said, "This helmet is no good!"

TUBERCULOSIS IN CORSICA.

IN his inaugural thesis Dr. François Serpaggi[1] shows that in spite of the healthy climate tuberculosis is very prevalent in Corsica, perhaps even more so than in many other French departments. He attributes this occurrence to three principal causes—namely, malaria, alcoholism, and consanguineous marriages. The whole of the sea coast, especially on the east, as well as the neighbouring regions up to an altitude of about 300 metres, is infested by malaria. All forms of the disease are met with, benign tertian being the most frequent. The prevalence of malaria is attributed by the writer to the return of numerous soldiers who had contracted the disease in the East. Alcoholism, and especially the consumption of absinthe, is widely spread throughout Corsica, even in the smallest villages. The inhabitants, who were formerly very sober, gave way to alcoholism some time before the war owing to the introduction of cheap alcoholic liquors. It is

[1] Thèses de Paris, 1919–20, No. 181.

therefore not surprising to find that tuberculosis in Corsica, as in Normandy and elsewhere, has gone hand in hand with alcoholism. Dr. Serpaggi states that infection chiefly takes place in the school where there is a complete absence of hygiene and no measures are taken to exclude tuberculous pupils. In some cases families are infected by soldiers who have been discharged from the army for pulmonary tuberculosis. The disease also appears to be spread by milk and butcher's meat, there being no meat inspection in Corsica, except at Ajaccio and Bastia. Lastly, the large number of dark, damp, and generally insanitary houses is an additional cause of the prevalence of tuberculosis in the island.

NATIONAL HEALTH INSURANCE IN SCOTLAND.

THE administration of National Health Insurance in Scotland during the years 1917–19 is dealt with in a White Paper just issued. The report states that the number of Approved Societies for health insurance purposes was 245 in 1919, compared with 312 in 1912. The total number of Scottish cards in August, 1919, was 1,275,029. In an outline of the history of health insurance in Scotland since its commencement in 1912 to the present day, the report acknowledges that when the Act first became operative it was unpopular with both employers and employed. It had been made the occasion of an intensely hostile campaign, which had created an attitude of mistrust, in connexion with which the antagonism of the medical profession was an important consideration. From the outset, however, the general attitude of the Scottish people was one of acceptance. Actual opposition occurred mainly in farming and fishing communities, especially the former. Definite resistance, however, only materialised in certain agricultural counties, in which both employers and employed made common cause. The attitude of the farmers strongly affected that of the tradesmen in the smaller towns and villages dependent upon agriculture. In the Highlands and Islands there was strong dislike for the Act, due largely, no doubt, to the small number of people in these areas employed under contract of service. There was little active resistance, but the definite opposition manifested in other areas continued for years, and was only worn down by great patience and hard work on the part of the Commission's inspectorial staff.

At the outbreak of war the great majority of the difficulties had been overcome, and the Commission had been able to consider seriously the problems of improved services and extension of benefits. Now that the difficulties of the war period have been successfully passed, the value of health insurance to the community can be developed upon a secure basis. The creation of the Scottish Board of Health is a first and necessary step to this end. The Commission hopes that the Board will find in the existing insurance machinery a foundation upon which the future health administration of the nation can be built up and improved. About 95 per cent. of the irregularities disclosed by inspection consist of late stamping of cards, the agricultural community and small employers being the principal offenders. Seven years' experience has shown the original machinery to be remarkably complete, but the insured person is still apt to realise his place in the scheme only when he requires benefit. Some societies interpret their rules in a way which, considering the ignorance of many of their members, can only be described as harsh. The collection of contributions by the stamping of contribution cards has proved satisfactory. The feeling against compulsory insurance has greatly diminished. The desire to remain outside the Act has rather been replaced by a desire to come within its scope and thus profit by its benefits. The only sustained criticisms are as to the sufficiency of the money benefits and the method of raising the funds required. There is little doubt that the money benefits have been very helpful to sick persons, though complaints have been received that in many cases too much of the money has gone to the doctor or the midwife. Medical benefit has been found to work well, even under the restriction of service necessitated by the war, and very little reliable evidence has emerged of neglect of duty on the part of insurance practitioners in support of loose general charges of inefficiency. There is, however, a feeling prevalent that certification of illness has not been performed with equal care by all practitioners. The Commissioners think there is reason for uneasiness, and share the general opinion that medical referees should be appointed to whom claimants could be referred.

With regard to the treatment of cases of tuberculosis, the Commissioners say that under the conditions of war these methods have had no chance of showing what their value really is. The Insurance Act has greatly stimulated the activities of local authorities in dealing with tuberculosis as an infectious disease. Should there come into existence a better organisation of local authorities many difficulties will be removed and the outlook will become more hopeful.

ANIMAL CASUALTIES DURING THE WAR.

THE recent war has demonstrated above all previous ones the economy of an efficient veterinary service for the care of animals both in health and disease, and the value of modern veterinary hygienic and preventive measures. The interesting and hitherto unpublished statistics compiled by the Veterinary Section of the Imperial War Museum (now at the Crystal Palace) show the totals of the British Army animal casualties throughout the war; these work out to less than 15 per cent. per year of the total number of animals on service, and are the lowest figures recorded in any campaign. Actually 484,143 animals lost their lives, including 5589 lost at sea through enemy action, and 22,812 camels (out of a total of 120,013); the percentage of mortality amongst camels was much higher than that amongst horses and mules. The fact that only 1·06 per cent. of the total animals shipped perished on the voyage is a great tribute to the efficient veterinary inspection before shipping and during the voyages, and the hygienic arrangements on board. To the Veterinary Service in particular must credit be given, for only those who have had experience in remount work and the purchasing of large numbers of animals, collected together from all parts of the earth, can know the chaos and risk of working without the skilled veterinary surgeon. Without his aid the most expert layman is soon lost in a tangle with mange, glanders, strangles, contagious pneumonia, epizootic lymphangitis, and a host of other contagious diseases, not to mention defects of wind and locomotion which speedily render the animals valueless for army work. In 1914 the average animal strength was 204,628, with 15·23 per cent. of sick, whilst in 1915, 1916, and 1918 the sick average fell to slightly over 10. Even in that terrible year, 1917, it only rose to 11·44, there being then 966,840 average strength, with 110,632 sick patients. The system of veterinary organisation to keep the animal army fit, and to deal with the sick in such a way that they were not an encumbrance, was well thought out and modelled on lines largely similar to those dealing with sick and wounded men. Veterinary officers at the front were concerned with prevention and first-aid only, the sick being collected in small groups and sent to the mobile veterinary sections, which units forwarded them to the very large hospitals down the line; these latter often contained between 3000 and 4000 patients each. Each sick animal on its way to the base passed through a Reception Hospital, where it was tested with mallein against that scourge of former armies, glanders; it was carefully inspected and treated for mange, ulcerative lymphangitis, influenza, and any other contagious ailment; the badly wounded received urgent aid; severe cases of debility were relegated to special hospitals; and the animals were grouped and arranged in batches according to their ailments. To the student of comparative medicine (and this section will soon include all medical men now that so many diseases have been proved transmissible from animals to man) the Veterinary Section of the Crystal Palace Imperial War Museum will prove of more than

passing interest. It illustrates graphically by means of photographs, models, war relics, and paintings (done by members of the Royal Army Veterinary Corps, amongst whom were voluntarily enlisted some of our best known animal painters) exactly how our sick and wounded animals were cared for on the battlefield and in hospital. Our veterinary colleagues earned well the title of "Royal" Army Veterinary Corps, conferred in recognition of good work. We congratulate them, not only on the title, but on the record of the British Veterinary Service.

BENZYL BENZOATE FOR PERSISTENT HICCOUGH.

SOME years ago Dr. David I. Macht announced the discovery, made in the Pharmacological Laboratory of the Johns Hopkins University, that the benzyl esters, particularly the benzoate, have a remarkable power of allaying spasm in unstriped muscle. In the *Medical Record* of July 24th he has described an important therapeutic application of this fact. He, as well as a number of practitioners who have communicated with him, have found benzyl benzoate of value in the treatment of hiccough—not only the mild forms so common in infants, but those forms which may be termed pernicious, in which the hiccough lasts for days and is unaffected by any kind of medical treatment, internal or external. The following are some examples:—

A man, aged 28 years, complained of persistent hiccough, which had continued for 24 hours in spite of the ordinary treatment. He was given a 20 per cent. solution of benzyl benzoate and ordered to take 25 drops in water every four hours. One dose was sufficient to stop the hiccough.

A man, aged 64 years, came under the observation of Dr. B. Sachs at the Hebrew Hospital, Baltimore, suffering from persistent hiccough of several days' duration which could not be relieved in any way. In the hospital various external applications, such as mustard plasters, were tried without success. Then medicine was given internally, but neither bromides, Hoffman's anodyne, morphine, nor any other drug gave relief. After taking a few doses of benzyl benzoate he was completely cured.

A woman, suffering from post-operative hiccough, was treated ineffectually with all ordinary drugs. The condition lasted over a week and she hiccoughed sometimes as often as 6 to 18 times a minute. Under benzyl benzoate she was relieved within 12 hours.

Dr. Macht also suggests that benzyl benzoate may be of diagnostic value in differentiating hiccough of purely central origin from that of peripheral origin. As the chief effect is on smooth muscle he thinks that the drug will be most useful in hiccough of peripheral origin. He finds that the most convenient method of administration is the one originally described by him. Benzyl benzoate acts best when given in a 20 per cent. solution in alcohol. Of this solution the patient takes 20 to 40 drops in water or milk. Dr. Macht has not found it convenient or advantageous to administer the drug in suspension in elixirs or syrups, and administration in capsules has produced irritation in some cases and rendered the therapeutic action too slow in others. To children the solution can be conveniently administered in sugar, water, or milk.

HOW TO TACKLE NERVE INJURIES.

THE committee appointed by the Medical Research Council to report upon injuries of the nervous system has brought in its findings[1] on the diagnosis and treatment of peripheral nerve injuries, and these will be endorsed by most surgeons who have had experience of such injuries in the great war. Before discussing the indications for and against operative treatment the report describes the various methods of testing nerve function with useful reference to the proper methods, the errors that may be made, and the "trick" movements which may deceive the investigator. Postural and nutritional treatment are then considered in their application to cases under observation in whom operative treatment is contra-indicated. In discussing the technique of operative treatment stress is laid on the necessity of conducting the operation as far as possible in a bloodless field, but exception is taken to the tourniquet on account of the oozing likely to take place afterwards. End-to-end union is insisted on as the only sound method where a portion of nerve trunk is irreparably damaged; flap operations, implantations, and transplantations are all condemned. Surgical opinion in general has been coming round to this view. Under the various nerve headings methods are described whereby such end-to-end anastomosis may be obtained. Fine linen thread or silk is recommended for suture material in anastomosis, less fibroblastic reaction occurring than when catgut is utilised. A useful section is devoted to the signs and symptoms pointing to functional recovery, and some effort has been made to investigate the rate of recovery according to the particular nerve injured. The committee finds that the interval between the wounding and the operation has no influence on the time taken for recovery, a statement of practical value if only by exercising a deterrent influence on hasty surgery. Every case of nerve injury requires careful observation and probationary treatment. Pain, more especially that known as causalgia, receives due consideration, and stress is laid on the psychological factor; the surgeon is not all-important, the patient must assist. Causalgia has been the despair of many a surgeon, but clear indications are given in the report as to when and how he should act, and in what manner he can obtain the coöperation of the patient. Finally, the more important peripheral nerves are considered in turn, indications being given for treatment, and special hints for difficult and complicated cases. The report may be regarded as a valuable addition to our knowledge of nerve surgery, for which the committee deserves our thanks.

[1] Medical Research Council Report No. 54.

"THE HOUSE-FLY AS A DANGER TO HEALTH."

A PAMPHLET by Major E. E. Austen bearing this title is being sent to all medical officers of health, who are invited to purchase further copies (3*d*. each) for local distribution to officials. In a brief explanatory note attached to the pamphlet the Chief Medical Officer to the Ministry of Health points out that the education of the public in the life-history of house-flies and the most effective ways of destroying them forms an important part of the preventive measures required to combat epidemic diarrhœa and other fly-borne infections. The excellent plates forming the frontispiece show the house-fly proper and certain other species more or less harmful with which it is often confused. Certain common errors as to the power of growth and habits of the house-fly are exposed. For example, a small fly in the house is not a young fly in the sense that it will grow larger, since the fly emerges from its pupa-case full grown. Again, those who regard heaps of stale horse-manure as potential breeding places are reassured, and are advised to concentrate on the covering, close-packing, or turning over the surface of dumps of less than 24 hours' standing, since these alone attract ovipositing flies. Turning over the surface checks breeding, because the excessive heat generated by the fermenting manure lower down in the dump kills the eggs. Traps for the slow-moving maggots and methods of destruction of adult flies (which can lay eggs within three weeks after the deposition of the eggs from which they themselves are developed) are described, but it is once again made obvious that the most rational way of dealing with the pest is to attack the breeding places. The pamphlet (No. 1 of a series) is concerned only with the problem of house-flies within the British Isles, but an expanded pamphlet (No. 1A, price 1*s*. 6*d*.), which treats the subject more exhaustively, can also be obtained from the Director, British Museum (Natural History), Cromwell-road, London, S.W. 5, as well as those on lice, fleas, mosquitoes, bed-bugs, and other insects and vermin.

REVERSION OF £13,000 FOR SHEFFIELD HOSPITALS.—Mr. E. Gamble Whiteley, of Sheffield, who died on March 25th, in his will, after making certain provisions for his widow and others, bequeaths the final reversion of his property, valued at £13,000, to the Sheffield Royal Infirmary, Sheffield Royal Hospital, the Jessop Hospital for Women, and the Sheffield Children's Hospital.

A PLEA FOR SIMPLE ANATOMICAL NAMES.

BASED ON THE FREE USE OF THE NATIONAL LANGUAGE.

BY WM. CUTHBERT MORTON, C.B.E., M.A. (CLASSICAL FIRST), M.D. EDIN.,

HONORARY DEMONSTRATOR OF ANATOMY IN THE UNIVERSITY OF LEEDS; LATE CAPTAIN R.A.M.C., IN CHARGE OF THE DEPARTMENT OF MUSCLE RE-EDUCATION, 2ND NORTHERN GENERAL MILITARY HOSPITAL (ORTHOPÆDIC).

I.—*Foreword.*

IN a paper such as this it is useless to weigh the merits, absolute and relative, of the British and the Basle terminologies. Assuming that the British is as unsatisfactory as the supporters of the Basle claim, and that the Basle is as intolerable as those of the British claim, and that the two are as incompatible as everyone claims, let us see what can be done by simplicity and the free use of the national tongue. Such a change would, of course, in no way check the use of Latin by any who might choose it. On the contrary, the simpler the national names the simpler would the international be, and the more direct their appeal.

In the past emphasis has always been laid on the need for an international list in which "Each part shall have only one name" (B.N.A.), and on the need for national description to use only the international names, but if anatomy is ever to become a live subject it will not be by any fetish worship of dead languages but by each man speaking in his own tongue, using Latin and Greek only where his own tongue fails, and even then only in their simplest forms. It is true that for comparison and verification every structure must have an international label, and although the B.N.A. insists that "The terms shall be merely memory signs, and need lay no claim to description or to speculative interpretation," it is, on the contrary, most important that these labels shall be descriptive. Yet it is futile to expect every writer in every land to sacrifice the terms of his just choice to any Procrustean code, least of all to one with so little scientific, linguistic, or literary merit as the B.N.A. The B.N.A. is sublime in that at one stroke it disposed of 25,000 terms; it is ridiculous in that the 5000 which survive were mostly chosen individually by postal ballot.

The great objection against new terms, however good, is the difficulty of changing over. No doubt this is great if the terms are mere labels, but no new term should be adopted unless it is more descriptive than that which it is to displace or else falls more naturally into line with its fellows. The more simple and descriptive the international names, the more easily and naturally will they fit into national description either in their original or in a nationalised or even in a pure national form. Though the simplest name is not always the shortest, it will often be found that in the end the shortest description is that which uses the simplest names.

It cannot be too strongly emphasised that the writer is pleading not for a particular code, nor for particular names, but for the one guiding principle of simplicity based on the free use of the national tongue. In fixing the form of a nomenclature, national or international, it is well to begin with (though not perhaps at first to finish) the names for the body as a whole and for its parts, then to name all the bones, then all the joints and ligaments, and so on. It would be foolish for any one person to formulate a complete list of terms, because unless the foundations were laid in terms acceptable to the whole profession, or at least to all anatomists, the whole superstructure would be worthless.

In this paper, some of the outstanding principles will be stated and their application illustrated by a few examples. It will often be necessary to suggest names without even mentioning the corresponding British and B.N.A. terms. In some ways this will be an advantage as a test.

II.—*The National Language.*

The national language should be freely used. None but a crank would speak of a man's cerebrum as being within his caput, or of respiration being the function of his pulmones, or blood-circulation that of his cor. It is a pity that so few national words have hitherto been used with a precise anatomical meaning. One is never troubled by such words as leg, thigh, arm, neck, and for these one would seldom use the Latin crus, femur, brachium, cervix, although these are familiar through their adjectives crural, femoral, brachial, cervical. It only needs a wider use of home words such as groove, pit, pulley, coil, and many others, for these to become equally familiar in scientific thought. This does not mean that their Latin forms would never be used, but free choice would make description less wooden and more pliable, and the national forms would clarify the student's ideas, and if he knows no Latin and less Greek they would help him to master as much of these languages as is needed. At present he is overcome by the complexity of the human body and the mysterious language in which it is described, whereas if he were trained to think in simple English and easy Latin, he should not find it so hard to master and to remember the facts. Both English and Latin forms are needed, and everyone must be free to choose in every case. If some will insist on using only Latin, and others nothing but English, it will be difficult to get on, but if those who like Latin will temper it with English, and those who prefer English will season it with Latin, everyone may be happy. He is no friend of anatomy, medicine, or surgery, who in these days lays too much stress on his own likes and dislikes.

III.—*The Direct Method.*

Every name should be as direct as possible. This method has been explained by the writer in a paper in THE LANCET of Sept. 8th, 1917, and it will be enough here to give a few examples.

Direct.	*Indirect.*	*Direct.*	*Indirect.*
Stylus.	Processus styloideus.	Cricus.	Cartilago cricoidea.
Corax.	Processus coracoideus.	Thyreus.	Cartilago thyreoidea.
Corona.	Processus coronoideus.	Quadrigemina.	Corpora quadrigemina.
Sphen.	Os sphenoidale.	Mammillæ.	Corpora mammillaria.
Ethmus.	Os ethmoidale.		
Arytæna.	Cartilago arytænoidea.		

One advantage is the simplicity of the Latin name. Sometimes a simple national equivalent can be used—e.g., crow of the scapula. The adjectives, too, are convenient—e.g., stylar, arytænal, ethmal, and compounds are readily found—e.g., thyreo-arytænal, stylo-hyal

IV.—*The Genitive and Adjective (Latin).*

The genitive should be used for immediate and the adjective for more remote relation. This is well seen in the bones, e.g.:—

Corona ulnæ.	Incisura radii ulnaris.
Stylus radii.	Facetta clavicularis acromialis.
Incisura ulnæ radialis.	Facetta acromii clavia.

V.—*The Use of the Diminutive (Latin).*

Where there are two structures of a kind, one larger than the other, the latter may be distinguished by the diminutive.

Arm-bone—Tuber. Tubercle.	Os brachii—Tuber. Tuberculum.
Sphen—Wing. Winglet.	Sphen—Ala. Alula.
Thigh-bone—Great trochanter. Small trochanter.	Os femoris — Trochanter. Trochantellus.

The single word provides a convenient adjective—e.g., alular. Thus one might say that the sphen had an alular (the optic) and three alar foramina (the round, the oval, and that of the angle, cf. arteria duræ angularis).

VI.—*The Human Body. Corpus Humanum.*

VII.—*Parts of the Body.*

For the main parts of the body, and for their chief subdivisions, national terms should be used, and only where these fail international, e.g.:—

(i.) Head, neck, limbs, chest; face, nose, chin; liver, stomach, brain; shoulder, thumb, fingers, knee.
(ii.) Abdomen, pelvis, perineum.

VIII.—*Position and Direction.*

(i.) *The mid- or median plane.*—Median should be reserved for the mid-plane—that is to say, the antero-posterior vertical plane which bisects the body. There is no median nerve.
(ii.) *Anterior and posterior.*—These can often be replaced by front- and back- (e.g., front-surface or back-surface, or, more simply, front and back of the arm); or, again, by fore- and hind- (e.g., fore-brain, hind-brain)—cf., above, below, upwards, downwards.

(iii.) *Superior, and inferior.*

(iv.) *Interior and exterior.*—Interior and exterior express relative distance from the mid-plane. The slight catch here is easily mastered, since the termination is the same as in anterior and posterior, superior and inferior. Moreover, *inner* and *outer* can usually be employed.

(v.) *Internal and external.*—Internal and external express depth within an isolated structure—e.g., external and internal muscular layers of the bowel. Inner and outer can often be used without risk of confusion.

(vi.) *Superficial and deep.*—Superficial and deep should be retained for depth within the body—e.g., the superficial and deep lymph-glands of the groin. At the same time, internal and external and superficial and deep may often be interchanged without confusion.

(vii.) *Lateral.*—Lateral should express symmetrical relation to the body (head, neck, and trunk only). E.g.—Lateral walls of the abdomen, lateral branches of the thoracic nerves. A good example of the use of these and other terms is found in the groin.

IX.—*The Groin in Relation to Hernia.*

(i.) *Herniæ of the abdomen.*—These are umbilical, inguinal (upper and lower), diaphragmatic, and so on.

(ii.) *The groin.*—The groin is the region where abdomen and thigh meet in front, along the line of the limiting tendon, which consists of two parts, the interspinous, swinging between the spines of the iliac and pubic bones, and the lacunar (or gap-tendon), filling in the inner part of the interval bridged by the interspinous tendon.

(iii.) *Canals of the groin.*—These are a lower and an upper.

(iv.) *Lower canal of the groin.*—This leads into the thigh and has a fascial ring and a fatty septum.

(v.) *Upper muscles of the groin.*—These are the superficial, middle, and deep muscles of the lateral wall of the abdomen. Each has a superficial and a deep fascia (in the B.N.A. sense), but the two most important of these are the superficial fascia of the superficial and the deep of the deep muscle.

(*a*) The *superficial* muscle in the groin is inserted into and actually forms the limiting tendon in its whole length, gaining attachment to the iliac and pubic bones through the interspinous and to the pectineal crest through the lacunar portion. It has also a decussate tendon which crosses to the other side.

(*b*) The *middle* muscle in the groin arises from the outer half of the interspinous tendon, and is inserted into the pubic and pectineal crests, mostly in conjunction with the corresponding tendon of the deep muscle, thus forming the conjoined tendon.

(*c*) The *deep* muscle in the groin arises from the outer third of the interspinous tendon, and is inserted by means of the conjoined tendon.

(vi.) *Upper canal of the groin.*—This pierces the three lateral muscles of the abdomen and their fasciæ, and it has three rings, deep, middle, and superficial, from each of which there passes into the scrotum a fascial (or fascio-muscular) sac, the deep sac being derived from the deep fascia, the middle sac from the deep and middle muscles (conjoined tendon), and the superficial sac from the superficial muscle and its superficial fascia.

(vii.) The *peritoneum* in the groin lines the abdominal wall, and has three pits or fossæ, inner, middle, and outer (interior, media, exterior), at the last of which it is evaginated through the upper canal of the groin into the scrotum. The upper part of this evagination becomes obliterated, but the lower persists as a saccule in relation with the testis and its cord.

(viii.) *Descent of the testis.*—The testis leaves the abdomen through the outer pit, descending into the scrotum by way of the upper canal of the groin, at each ring of which it receives a covering. It is therefore covered in by:—

i. Skin. Subcutaneous tissue.
ii. Superficial, middle, deep sacs.

(ix.) *Herniæ of the groin.*—These are lower or upper, according as they pass below or above the limiting tendon.

Lower herniæ pass into the thigh (being usually called femoral).

Upper herniæ make their way towards the scrotum (being often called scrotal), and are outer, middle, or inner, according as they begin opposite the outer, middle, or inner pit of the peritoneum.

An *outer* hernia starts at the outer pit, and, covered by peritoneum and extraperitoneal tissue, it passes through the deep, middle, and superficial rings of the upper canal, appropriating in turn the three sacs which enclose the testis and its cord, and which are themselves covered in by the subcutaneous tissue and skin.

A *middle* hernia starts at the middle pit, and, covered by peritoneum and extraperitoneal tissue, it bursts through and makes a special covering for itself out of the deep fascia, and then it passes through the middle and superficial rings, appropriating the middle and superficial sacs, which are themselves covered in by the subcutaneous tissue and skin.

An *inner* hernia starts at the inner pit, and, covered by peritoneum and extraperitoneal tissue, it bursts first through the deep fascia and then through the conjoined tendon of the deep and middle muscles, and perhaps also the decussated tendon of the opposite superficial muscle, and, having thus made for itself two special coverings, it passes through the superficial ring, appropriating the superficial sac, which is itself covered in by the subcutaneous tissue and skin.

Outer, middle, and inner herniæ might also be called direct, and outer and inner indirect, according to their relation to the upper canal of the groin.

X.—*On Proper Names.*

Proper names should be avoided in writing, although each school may teach the names of those who have done good service to anatomy there or elsewhere.

In the past proper names were recklessly used. Thus, the ileo-cæcal valve was also known as the valve of Bauhinus, the valve of Tulpius, and the valve of Falloppius. Again, although the limiting tendon of the groin was unnamed, its interspinous and lacunar portions were known as Poupart's and Gimbernat's ligaments. The student's chief interest in Poupart is usually whether the name should be pronounced Poopah or Powpart, and he always has an uneasy feeling that something is wrong with Gimbernat, who may after all have been a Frenchman. Again, the mid-brain canal is called the aqueduct of Sylvius. Now, "Who is Sylvia?" is an interesting enough question, but why worry about Sylvius? The writer once heard Sir William Turner explain to his class that Sylvius was an Englishman named Wood, and that fissura Sylvii was adopted for Wood's fissure because it sounded and looked so much better than fissura Woodi. Perhaps, however, Sir William was only making merry. Be that as it may, an anatomical lecturer much more learned in such things than the writer recently claimed that Sylvius was one or other of two Frenchmen (he did not know which), whose names were Le Bois and Du Bois, or the like. Lastly, a physician was recently pleading for keeping this name "out of reverence for the master who taught in Florence." "Padua," said the writer at a venture. "Padua, to be sure," replied the physician unabashed.

And so the smoking torch of knowledge is handed on, each receiving it reverently, and reverently passing it on without troubling to see whether within the smoke there is or ever has been any light.

XI.—*The Bones.*

Every bone should be named after the region or part of the body to which it belongs, and where such region or part contains more than one bone these should be distinguished by some feature, actual or fanciful. It is more important that names derived from such features should be short and simple than that they should be specially appropriate.

Thigh—Thigh-bone.	Femur—Os femoris.
Arm—Arm-bone.	Brachium—Os brachii.
Leg — Leg-bones: Flute-bone, brooch-bone.	Crus—Ossa cruris: Tibia, fibula.
Wrist — Wrist-bones: Skiff-bone, moon-bone, wedge-bone, pea-bone, saddle-bone, boot-bone, great bone (of the wrist), hook-bone.	Carpus—Ossa carpi: Scaphus, luna, cuneus, pisum, sella, cothurnus, magnum, uncus.
Brow—Brow-bone.	Frons—Os frontis.
Temple—Temple-bone.	Tempus—Os temporis.
Nose—Nose-bone.	Nasus—Os nasi.
Cheek—Cheek-bone.	Mala—Os malæ.
Palate—Palate-bone.	Palatum—Os palati.
Flank—Flank-bone.	Ilium—Os ilii.
Lower limb — Girdle-bone: Flank-bone, bone of the pubes, sciatic bone.	Membrum inferius — Os cinguli: Os ilii, os pubis, os sciaticum.

Notes.—(1) Humerus is not needed for the arm-bone and badly needed for the shoulder, which has at present no international name. The B.N.A. articulatio humeri begs the question. (2) Those who stickle for linguistic accuracy and object to os temporis, os ilii, should bear in mind that ilium is a genitive plural, pubis a genitive singular, and ischium the name of a region. Nomenclature should be the handmaid and not the mistress of science.

XII.—*Parts of the Bones.*

(i.) The parts of a bone should be named intrinsically, each part having a name indicating its character (actual or fanciful) and its relation to the bone itself without reference to any other part of the body.

Radius—Style.	Radius—Stylus.
Ulna—Crown.	Ulna—Corona.
Scapule—Crow.	Scapula—Corax.

(ii.) Where this is not satisfactory an extrinsic term may be employed, the part of the bone being distinguished by its relation to some structure or part of the body other than the bone itself.

(*a*) A trial may be made with a local term, the part of the bone being named after its relation to some neighbouring structure or part.

Thigh-bone—Patellar surface.	Os femoris—Facies patellaris.
Ulna—Radial notch.	Ulna—Incisura radialis.
Scapule—Vertebral border.	Scapula—Margo vertebralis.

(*b*) A general term may have to be tried, the part of the bone being named according to its position in the body.

Limbs—Upper, lower.	Membra—Superius, inferius.
Scapule—Angles: Upper, lower.	Scapula — Anguli: Superior, inferior.

(*c*) It may be necessary to appeal to comparative anatomy for a term, especially in relation to development. All such terms should be avoided as much as possible. It is almost beyond belief that anyone should wish to change upper and lower for cephalic and caudal. "We're not as tabbies are," and there is no reason why human anatomy should continue on its belly with its tail sticking out behind it, when the being whom it is supposed to describe has long since got his back up, dcffed his tail, and walked upright.

(*d*) If all the above fail, some adventitious name may be chosen, perhaps to the glory of some investigator. Proper names should, however, only be adopted if no others can be found satisfactory.

The intrinsic and extrinsic methods should preferably be employed in the order given above and they may be applied to the scapule. This is a flat triangular bone with two surfaces, three angles, and three sides or borders. It is natural therefore to look for an apex and a base, and these are best found in the outer angle and the posterior or vertebral border, and the two other angles thus become the basal angles. Since the intrinsic method will yield no more the remaining sides may be distinguished by local extrinsic terms as the cervical and axillary borders, and similarly these are costal and dorsal surfaces, dorsal being here used with a local rather than a general significance. The remaining angles would be distinguished by more general epithets as the upper and lower basal.

This method, which is by no means essential, might avoid considerable discussion and the international terms, though labels,

would be descriptive. But these terms would not need to be slavishly followed, and it would be open to anyone to speak of the vertebral border, or the outer angle, or the deep surface, provided always that the context was so plain that no confusion could arise. Wherever there was any risk the international terms should be used in either the Latin or an Anglicised form. As national equivalents the writer prefers for general use superficial and deep surface, outer, and upper and lower (basal) angles, and posterior, upper and outer borders, as well as the alternatives apex and base. The last is very convenient in dealing with the muscles. Also, super- and sub- have their place—e.g., superscapular muscles.

The arm-bone has many parts which can be named intrinsically, although extrinsic expletives can always be added. There are times when the student may like to pick up a bone and study it by itself, without for the moment troubling about its relations to any structure except the other parts of the skeleton. Thus one might take a rapid survey of the head, anatomical neck, tuber and tubercle with the straight groove (with its floor and inner and outer crests), surgical neck, shaft, spiral groove, eminence, line, outer and inner borders, anterior surface (with inner and outer areas), posterior surface, radial and ulnar (both coronal and olecranal) pits, little head, pulley, and inner and outer nodes (the former with its groove).

A word about condyle. It is curious that the metacarples should in these days have heads instead of condyles, although their head-ends form the condyles (κόνδυλοι) or knuckles from which the term is derived. What in these days is a condyle? And what an epicondyle? While the metacarples have neither condyles nor epicondyles, the tibia and occipital bone have condyles but no epicondyles, the arm-bone has epicondyles but no condyles, and the femur has both condyles and epicondyles. A condyle may be a more or less definite knuckle with a convex facet as in the femur, or, again, an ill-defined mass with the concave facet into which that knuckle fits as in the tibia. Why not, then, use condyle for any knuckle of bone with a facet? The condyle of the mandible is described as including the neck as well as the head with its facet. Why not let the arm-bone have its upper condyle or knuckle with the head, anatomical neck, tuber and tubercle, and its lower condyle or knuckle with the little head, pulley, and inner and outer nodes? The epicondyles would then vanish into the limbo whence they came. The lower condyle of the femur would in this way consist of inner and outer condyles with the intercondylar notch.

XIII.—*The Joints and Ligaments.*

A. *The Joints.*

Every joint should be named after the bones which it articulates, and should be regarded as provided by one bone which is fixed for the benefit of another which is movable.

The movable bones may be regarded as articulated in succession. The nucleus of the system is the sacrum, which provides for the movement of (i.) the coccyx, (ii.) each vertebra in succession up to the axis, which in turn provides for the atlas, and this again for the skull, on which finally the lower jaw moves. The vertebræ provide for the ribs, and these again for the sternum. For the upper limb the clavicle is articulated with the sternum, the scapule with the clavicle, the arm-bone with the scapule, the bones of the forearm with the arm-bone, the radius also with the ulna, the first row of wrist-bones with the bones of the forearm (though separated from the ulna by the triangular septal cartilage), and so on. In the wrist the individual bones are articulated in succession from without inwards—e.g., the scaphus takes on the lune, the lune takes on the cuneus, and the cuneus takes on the pisum, and so with the second row. So also throughout the lower limb.

The practical result of the succession of the bones is that in the international list most of the joints can be named after the bones which form them. In national description the joint of the clavicle with the sternum may, according to the context and the preference of the individual writer, be named in any of four ways—namely, sternoclavian joint, clavisternal joint, sternal joint of the clavicle, clavian joint of the sternum. For the international list one only of these forms can be admitted and here the rule of succession comes into play, so that this joint would be either the sternoclavian joint or the sternal joint of the clavicle. Although in its full form the latter is the longer, it is to be preferred, because in practice it is really simpler and can often without confusion be reduced to the sternal joint of the clavicle or even the clavicular joint. Thus, in describing the sternum one may speak of its clavicular and costal joints, whereas in describing the clavicle one may equally well speak of its sternal and scapular (or acromial) joints. Moreover, one can use this form for making the name more detailed and precise as the sternocostal joint of the clavicle.

The rule of succession would be of value chiefly in determining the form of the international terms. The scapular joint of the arm-bone would, of course, usually be spoken of in Britain as the shoulder-joint. On the other hand, the elbow-joint is so complex that it would appear as such in the international list also.

On this principle one might enumerate those joints of the upper limb which have a complete capsule as follows:—

Sternocostal joint of the clavicle.	A. claviculæ sternalis.
Clavicular joint of the scapule.	A. scapulæ clavicularis.
Scapular joint of the arm-bone.	A. (ossis) brachii scapularis.
Elbow-joint.	A. cubiti.
Wrist-joint.	A. carpi.
Cuneal joint of the pisum.	A. pisi cunealis.
Complex joint of the table of the hand.	A. manus tabulæ complex.
Sellar joint of the thumb metacarple.	A. pollicis metacarpuli sellaris.
Interphalangeal joints.	Aa. interphalangeales.

Once the rule of succession had become familiar the international terms could be reduced to A. claviculæ, A. scapulæ, A. brachii, A. cubiti, A. carpi, A. pisi, A. manus complex, A. pollicis metacarpuli, A. phalangis secundæ, A. phalangis tertiæ. The various British equivalents which might be substituted for the above are too obvious to be given here.

The same method may be applied to the part-joints—e.g., the elbow-joint may be tabulated as follows:—

Elbow-joint.
- (i.) Brachial joint of the forearm. Brachial joint of the ulna. Brachial joint of the radius.
- (ii.) Upper joint of pronation. (Brachial joint of the radius.) Upper ulnar joint of the radius.

The wrist-joint to be in harmony with the other septate joints should include the lower joint of pronation and the radio-septal joint of the wrist.

Other examples of succession in their short form are A. pisi, A. cubi, A. mandibulæ, A. phalangis primæ pollicis.

B. *Classification of the Joints.*

Whatever nomenclaturists devised the names for the various types of joints must have wallowed in Greek—of a kind. Symphysis, arthrodia, ginglymus, gomphosis, synchondrosis, synarthrosis, enarthrosis, diarthrosis, amphiarthrosis, syndes—Moses! What a list for a student who knows no Latin and less Greek.

(i.) *Movable and immovable joints.*—Each joint may be regarded as provided by a bone which is fixed for another which may or may not be movable, the ligaments and muscles being regarded as arising from the former bone for retaining or moving the latter.

(ii.) *Continuous, partly continuous, and discontinuous joints.*—The continuous are immobile, whereas the partly continuous and discontinuous are mobile.

(iii.) *Continuous joints.*—These may be distinguished by the character of the uniting tissue, as membranous, cartilaginous, and ossified, and the membranous, which may retain the name of sutures, may be distinguished according to the form of the articulating surfaces—e.g., linear, plane, serrate, sulcal, alveolar, squamous.

(iv.) *Partly continuous joints.*—Such are the intercentral joints of the vertebræ. Singly these present little movement, but from the point of terminology we may glance at the movements which might take place between any two discs separated by a firm but elastic medium.

- (*a*) *Rotation.*—The moving disc may rotate on the fixed disc around its own axis which may be regarded as perpendicular.
- (*b*) *Lapse.*—The moving disc may slip bodily on the fixed disc, in which case its axis remains perpendicular but is shifted out of place.
- (*c*) *Flexion.*—The moving disc may be tilted, in which case its axis leans over to one or other side.
- (*d*) *Approximation and separation.*—The moving disc may approach or go away from the fixed disc.
- (*e*) *Mixed movements.*—Thus, theoretically, all these movements might take place at once.

(v.) *Discontinuous joints* are either (*a*) ligamentous (e.g., lower tibial or fibular), or (*b*) capsular, the former giving slight lapse only, the latter giving varying degrees of rotation, lapse, and flexion, but of course, no approximation or separation.

Capsular joints may best be distinguished according to the nature of the facet provided by the fixed bone—e.g., plane, concave, convex, and so on.

- (*a*) *Plane joints*—e.g., cuneal of the pisum.
- (*b*) *Concave joints.*—Uniconcave or notch-joints (incisural)—e.g., upper ulnar of radius. Biconcave or boat-joints (navicular)—e.g., radio-septal of wrist. Universal concave or cup-joints (pocular). These are shallow cup- or glenal as at the shoulder, and deep cup- or cotylar as at the hip.
- (*c*) *Convex joints.*—Uniconvex or wheel-joints (rotal)—e.g., lower ulnar of radius. Biconvex joints (antinavicular?)—e.g., astragalar of scaphus, which is almost a ball-joint. Universal convex or ball-joints (global)—e.g., brachial of radius.

Or the facet may be a modification or combination of the above, e.g.:—

Irregular joints—e.g., between some of the wrist-bones.
Concavo-convex joints—e.g., joint of the second row of carples.
Saddle-joints (sellar)—e.g., joint of the thumb metacarple.
Pulley-joints (trochlear)—e.g., brachial of the ulna.
Antitrochlear joints—e.g., part of the ankle-joint.

Capsular joints may also be classified according to the nature of the movements which actually take place in the moving bone, e.g.:—

Labile—e.g., femoral of patella.
Flexile.—Uniflexile or hinge- (cardinal)—e.g., elbow. Biflexile—e.g., radio-septal of wrist. Universal flexile—e.g., shoulder-, hip-.

Capsular joints may also be: *Septate*, having a septal cartilage—e.g., temporal of mandible. *Compound*, being formed by more than two bones—e.g., knee-, elbow-, astragalar of heel-bone and scaphus.

In compound joints one may need to study: (*a*) the form of each facet, simple and compound. (*b*) The movements which each facet should allow. (*c*) The limitations imposed by ligaments and neighbouring structures. (*d*) The movements which actually take place at each facet. (*e*) The movements which actually result in the part—e.g., thigh, hand.

Capsular joints show only rotation, lapse, or flexion, or combinations of these, and flexion may be further defined according to the direction—e.g., forward, backward, inward, outward, upward, downward, or by the special terms flexion, extension, adduction, abduction, levation, and depression.

C. *The Ligaments.*

The ligaments of the capsular joints are: (i.) the capsule, parts of which may form capsular ligaments; (ii.) accessory ligaments.

(i.) Capsular ligaments may be briefly named after the joint—e.g., anterior, posterior, inner, and outer of elbow-joint, or more strictly of the brachial joint of the forearm. Sometimes a bony relation will be mentioned—e.g., upper, middle, and lower glenal of the shoulder-joint, or iliac, pubic, or sciatic of the hip-joint, or, again, the collar ligaments of the radius and thigh-bone.

(ii.) Accessory ligaments will mostly be named after bony attachments—e.g., costal of the clavicle, clavian of the crow, fibular of the tarsus (or outer of the ankle), the last consisting of the anterior and posterior fibular of the astragalus and the fibular of the heel-bone.

Ligaments which join two parts of the same bone may be named in two ways—e.g., (1) coraco-acromial, (2) ligament of the notch of the hip-cup or acetabulum, according as the two parts have special names or not.

XIV.—*Muscles.*

Every muscle should be named after its origin and insertion, and where necessary or convenient the name should indicate not merely the bones concerned but the actual parts to which the muscles are attached.

Had we been living in the days when Latin was the language of science this problem would have presented little difficulty. An eminent anatomist has recently pleaded for a nomenclature based on an exhaustive study of many different languages. Such a hope is futile. It is difficult to find five men interested in their own national terminology, and how shall we find even one interested in ten? Fortunately, the names are to be found by the study not of many national nomenclatures but of the body itself. In the case of the muscles, the aim should be either brevity with all possible description or description with all possible brevity. The writer prefers the latter.

One of the best examples for illustrating the method is the latissimus dorsi (Br., B.N.A.) because of its complex origin and well-defined insertion. The insertion would be arrived at by what might be called the step-method.

			Arm.
		Bone of	Arm.
	Straight groove of	Bone of	Arm.
Floor of	Straight groove of	Bone of	Arm.
Muscle of Floor of	Straight groove of	Bone of	Arm.
Nerve of Muscle of Floor of	Straight groove of	Bone of	Arm.
			Brachium.
		Os	Brachii.
	Sulcus rectus	Ossis	Brachii.
Fundus	Sulci recti	Ossis	Brachii.
Musculus Fundi	Sulci recti	Ossis	Brachii.
Nervus Musculi Fundi	Sulci recti	Ossis	Brachii.

To the genitive of the insertion would be added the adjective of the origin. This muscle would therefore become the iliospinal, costal and scapular muscle of the floor of the straight groove of the arm-bone, M. iliospinalis et costalis et scapularis fundi sulci recti ossis brachii, and it might well adopt for its motto, "Nemo me impune lacessit." After all, however, the costal and scapular origins are subordinate, and since the student is not likely to be misled into wondering whether the muscle acts upon the fundus of the stomach or bladder or even on that of the eye, it will be enough to speak of the iliospinal of the floor, iliospinalis fundi, and on occasion the name may be even further shortened, so that, e.g., the muscles of the posterior wall of the axilla might be enumerated as the subscapular, the iliospinal and the angular (subscapularis tuberculi, iliospinalis fundi, angularis cristæ interioris). We should also have the nerve to the iliospinalis fundi.

Other Examples.

(1) The muscles inserted into the mastoid (?) are the sterno-clavian, the spinal, and the alo-articular. (N.B. Ala = processus transversus.)

(2) The scalene (?) group consist of the anterior and posterior scalenes of the first rib and the scalene of the second rib.

(3) The muscles attached to both bones of the shoulder girdle are the occipitospinalis of the girdle and the cingularis of the arm.

(4) The pectoral muscles are the pectoral of the clavicle, pectoral of the scapula, and pectoral of the arm, or in greater detail, the pectoral or costal of the groove of the clavicle, pectoral or costal of the crow of the scapula, pectoral or sterno-costo-clavian of the outer crest of the straight groove of the arm-bone.

(5) The muscles inserted into the scapula only are the alar, the upper and lower spinal, the costal of the base, and the pectoral or costal of the crow.

(6) The deltoid and coraco-brachialis (e.g.) and their bony attachments become the cingularis of the eminence and the eminence of the cingularis, the coracalis of the line and the line of the coracalis.

(7) In the outer column of the erector of the back the three muscles become the iliac of the angles, the interangular, and the angular of the alæ (ala = processus transversus, chiefly because short and simple).

(8) The muscles inserted into the arm-bone are the supraspinate, infraspinate, and marginal of the tuber, the subscapular of the tubercle, the iliospinal of the floor of the straight groove, the angular of its inner and the pectoral of its outer crest, the cingular of the eminence, and the coracal of the line.

(9) The muscles of the lateral wall of the abdomen are the superficial, middle, and deep (here the bony attachments are too complex).

(10) Arising from the style of the temple-bone are the stylar muscles of the tongue, of the pharynx, and of the U-bone (or hyal bone).

(11) The extrinsic muscles of the tongue are the stylar, the hyal, and the palatine of the tongue and the submental of the tongue and U-bone.

(12) The muscles of the mouth are i., the annular or ring-muscle and the buccinator or trumpeter; ii., (*a*) the mandibular of the lower lip; (*b*) the mandibular, risorius, malar, and canine of the angle; (*c*) the malar, infraorbital, and angular of the upper lip, with which last is associated the angular of the ala of the nose.

(13) The constrictors of the pharynx are the upper or pterygo-mandibular, the middle or hyal, and the lower or thyreo-crical.

(14) Iliocentral of the trochantellus.
Iliac of the trochantellus.
Central of the trochantellus.
Superthyral of the pit of the trochanter.
Subthyral of the summit of the trochanter.
Calcaneal extensor.
Biceps of the tubercle of the radius.
Triceps of the heel.
Biceps pronator.
Prænodal } heads.
Coronal }
Prænodal of the index metacarple.
Prænodal of the palmar fascia.
Prænodo-ulnar of the pisum.
Triceps of the second phalanges.
Radial of the third phalanges.
Tibial flexor of the toes.
Fibular flexor of the great toe.
Sphenopterygal of the neck of the mandible.
Pterygo-maxillary of the angle of the mandible.
Tubosphenal tensor of the palate.
Tubopetrous levator of the palate.

Everything depends on how the international terms are to be used. If national description is slavishly to employ only the international terms it will remain for ever wooden, dry, and dead; but if it be allowed the simplicity and fluency of the national tongue it will live during the period of study and survive in the memory. Most of the muscles are sufficiently defined by short names, the word muscle being avoided by the Latin form—e.g., occipitospinalis, cingularis, alaris scapulæ, extensor calcaneus, tubosphenalis, subthyralis, gemellus spinosus, musculus pisi, brachialis coronæ, coracalis, flexor secundarum. The thyral muscles are the subthyral culminis trochantri and the superthyralis fossæ trochantri, but these are sufficiently defined as the subthyralis culminis and the superthyralis fossæ, or even as the sub- and super-thyralis. They may be grouped together as the thyrales.

In many cases classification will do away with undue formality—e.g., the prænodalis indicis metacarpuli, prænodalis palmæ fasciæ, and prænodo-ulnaris pisi—may well be classed in national description as the outer, middle, and inner flexors of the wrist. So, too, the pectorals may be distinguished as the great, the middle, and the small—cf., glutei.

XV.—*Nerves.*

Everything being so contingent it is not proposed to deal here in great detail with the nerves.

(i.) A nerve shall retain or suggest its name from beginning to end.

The trigeminus splits into three parts—the first, frontal or supra-orbital geminus; the second, maxillary or infraorbital geminus; and the third, mandibular or mental geminus.

Trigeminus.	N. trigeminus.
First geminus.	N. geminus primus.
Branches: Lacrimal.	Rami: Lacrimalis.
Nasal.	Nasalis.
Supratrochlear.	Supertrochlearis.
Second geminus.	N. geminus secundus.
Third geminus.	N. geminus tertius.

(ii.) A motor nerve shall be named after the muscle or muscles which it supplies, and if that is not satisfactory after a bone or other structure with which it comes into relation.

One would thus have the nerve to the cingularis, nerves to the alaris of the scapule, nerve to the spinales of the scapule, nerve to the spinati, nerve to the coracalis, nerve to the costalis of the base of the scapula, nerve to the clavicular pectoral, nerves to the temporalis, nerves to the pterygo-maxillaris, nerve to the stylaris of the pharynx, nerve to the thyrealis crici.

(iii.) A mixed nerve shall be regarded as a motor nerve giving off sensory branches.

Thus the ulnar nerve has muscular branches and ends in muscles, and it also gives off cutaneous branches—namely, one to the back of the hand, one to the palm of the table of the hand, and several to the palm of the fingers, or, in other words, a dorsal manual, a palmar tabular, and several palmar digital cutaneous branches; or, again in other words, the ulnar dorsal manual, ulnar palmar tabular, and ulnar palmar digital cutaneous nerves.

Again, the spiral nerve (Br., musculo-spiral; B.N.A., radial) ends on the back of the hand, giving off cutaneous branches—namely, two to the arm, one to the forearm, and one to the hand; or, in other words, two brachial, an antibrachial, and a manual cutaneous branch; or, again in other words, the spiral cutaneous nerves of the arm, forearm, and hand.

From this point of view it is well to make the nerves as long as possible—e.g., to carry back the ulnar nerve right up to the spinal cord, in which case it would arise by two roots, and then proceed successively through the neck, axilla, arm, forearm, and hand, giving off, among others, a pectoral muscular branch, and brachial and antibrachial cutaneous branches; or, in other words, the ulnar pectoral nerve, and the ulnar cutaneous nerves of the arm and forearm. This can be done with the other great nerves derived from the brachial plexus.

The international terms may be chosen by a method which will be illustrated in the case of the arteries. Some will be named as branches of the parent trunk, others as nerves supplying certain structures.

XVI.—*Arteries.*

The principles governing the naming of the arteries somewhat resemble those for the nerves. Thus the arteries should be given names which will extend over as long a stretch as possible—e.g., the left brachial artery begins at the aorta and is distributed to the whole limb. At the same time its main divisions and branches may for convenience be called by separate names.

The heart gives off the systemic artery (= aorta) and the pulmonic artery.

The aorta gives off the arteries of the heart (= Aa. cordis), the cervico-brachial and the left cervical and left brachial arteries. The left brachial has a thoracic, a subclavian, an axillary and a brachial (proper) part (e.g., = subclavian artery, axillary artery), and it then divides into radial and ulnar parts (= radial and ulnar arteries), which again divide into superficial and deep vessels, which finally stomatose to form the corresponding arches of the palm.

The left cervical artery ascends through the thorax and neck and divides into the temporo-facial and the petrous artery of the brain (cf. vertebral artery of the brain).

The temporo-facial divides into a temporal, and two facial parts (= A. temporis, A. faciei superficialis, and A. faciei profunda), and it has certain other branches—namely, thyreal (= A. glandulæ thyrealis superior), lingual (= A. linguæ), post-auricular (= A. post-auricularis), and occipital (= A. occipitis).

The petrous artery of the brain divides into cerebral branches (= A. cerebri anterior, A. cerebri media).

The cervico-brachial (= A. cervicis et brachii, which is more convenient than A. capitis et membri superioris) divides into the right cervical and right brachial, which resemble the left except that they have no thoracic part.

And so on.

The method is well seen in the axillary artery, the branches of which go (*a*) to the inner, (*b*) to the anterior, (*c*) to the posterior, and (*d*) to the outer wall of the axilla.

Cervico-brachial artery = A. cervicis et brachii.

Brachial artery = A. brachii.

Axillary part = Axillary artery = A. axillæ.

Thoracic branch = Axillary thoracic artery = A. thoracis axillaris.

Pectoral branches

= Pectoral arteries	= Aa. pectoris.
Upper.	Superior.
Lower.	Inferior.

Scapular branch = Outer scapular artery = A. scapularis exterior.

Brachial branches

= Brachial circumflex arteries	= Aa. brachii circumflexæ.
Anterior.	Anterior.
Posterior.	Posterior.

The systemic artery or aorta divides into the pelvi-femoral arteries, each of which again divides into the pelvic and femoral arteries, the latter having an iliac portion (= iliac artery = A. ilii), an anterior femoral portion (= A. femoris anterior) and a popliteal portion (= A. poplitis), which last divides into the anterior and posterior arteries of the leg (Aa. cruris anterior, posterior), which latter gives off the fibular artery (= A. cruris fibularis), and ultimately divides into the inner and outer arteries of the sole (= Aa. plantæ interior, exterior).

Enough.

Whatever system is adopted, there must be plenty give and take, and probably for everyone more giving than taking.

XVII.—*Correlation.*

Some examples of correlation may be given.

(i.) Pectoral region.—Pectoral fascia; Pectoral membrane.

Pectoral muscles—Of the arm = great pectoral. Of the scapule = middle pectoral. Of the clavicle = small pectoral.

Pectoral nerves: Radial pectoral—Upper = Nerve to the small pectoral. Lower = Nerve to the great and middle pectorals. Ulnar pectoral = Nerve to the middle pectoral.

Pectoral arteries: Upper; Lower.

Pectoral cutaneous branches of the cervical nerves: Inner; Outer. (Cf. also humeral cutaneous branches.)

(ii.) Thyra (i.e., door) of the pelvis.—Thyral groove. Thyral tubercles. Thyral membrane. Thyral muscles; Superthyral. Subthyral. Thyral nerve. Thyral artery.

(iii.) Occipital bone.—Jugular foramen. Jugular sinus. Jugular vein. Jugular nerve of the pharynx. Wandering jugular nerve. Jugular nerve of the girdle.

(iv.) Scapular stomatosis.—The scapular arteries—posterior, upper, and outer—stomatose freely in the subscapular fossa, at the base and beside the upper and lower basal angles, and in the superscapular fossæ (supra- and infra-spinate). The posterior is found in all these places, the upper fails only at the lower angle, while the outer fails above the spine—that is to say, in the supraspinate fossa and at the upper angle.

(v.) The heart.—Trabecular, pectinate, moderator, papillary muscles.

(vi.) Branches of the aorta to the alimentary canal in abdomen.—First, second, third enteric arteries.

(vii.) The primitive enteron becomes moored to the posterior abdominal wall by the common mesentery and each of the organs into which the tube becomes differentiated has a corresponding part of the common as its own special mesentery—e.g., gastric, duodenal, jejuno-ileal, and colic mesenteries. The splenic portion of the gastric mesentery at one time consists of the parietal ligament of the spleen and the splenic ligament of the stomach. Later it is represented by the renal ligament of the stomach, which consists of the renal ligament of the spleen and the splenic ligament of the stomach. So, too, the pancreatic portion of the gastric mesentery at one time consists of the parietal ligament of the pancreas and the pancreatic ligament of the stomach. Later the pancreas loses most of its parietal ligament and becomes fixed to the wall, and the pancreatic ligament of the stomach is divided by the transverse colon into the pancreatic ligament of the colon (also called the secondary mesentery of the transverse colon) and the colic ligament of the stomach (also called the omentum).

(viii.) The liver and duodenum descending into the abdomen draw down the umbilical and portal veins and so give rise to the umbilical and portal ligaments. The liver has also its phrenic ligament, consisting of three parts, right, left, and coronary.

(ix.) The Mullerian ducts ultimately form the uterus and its tubes. On each side there is a common mesentery of the uterus and tube, which is regarded as being divided by the attachment of the ovarian mesentery into a mesentery of the uterus and a mesentery of the tube. The common and ovarian mesenteries together form the broad ligament of the uterus.

(x.) The urinary bladder has two lateral and one posterior reflection of peritoneum, and three peritoneal ligaments, one urachal and two ureteric.

(xi.) The testis has a fibrous tunic, a fibrous hilus, and fibrous septa. Its duct forms the epitestis, and its artery, veins, lymph-vessels, and nerves form its cord (e.g., tunica fibrosa, hilus fibrosus, arteria testis, plexus venarum testis, suspensor testis, nervus suspensoris testis, chorda testis).

(xii.) The brain (cerebrum) is developed from three ventricles, each being a bellying out of the neural tube and consisting of a wall and a cavity. The cavity of the second or mid-brain ventricle becomes the mid-brain canal, and that of the third or hind-brain ventricle becomes the hind-brain cavity and hind-brain canal. The first or fore-brain ventricle becomes the thalamus or chamber of the brain (with roof, floor, and four walls), the sides of which have bellied out and become moulded to form the lateral ventricles, the surface of which is marked by coils with intervening fissures and grooves, while the cavity consists of a body with frontal, temporal, and occipital recesses, and has a mouth through which it joins the thalamic cavity.

The brain is intricate enough without hypnotising the student by polysyllabic profundity. Encephalon, rhombencephalon, telencephalon, myelencephalon, prosencephalon, metencephalon, diencephalon, and the rest! "Sack the lot!" No one will suffer apart from the sciolistic lovers of turgid and turbid sonorosity. It is not as though all the above terms were used in the same sense by everyone, for it is worthy of note that those who indulge too freely in such terms are apt to become so intoxicated by the exuberance of their own terminological eloquence that they cannot agree among themselves.

Very little has been said of the organs, but of the making of terms there is no end, and many examples are a weariness of the flesh.

XVIII.—*Afterword.*

Cui bono? Who benefits?

The writer? This was answered by John Barclay in his New Nomenclature at the beginning of last century.

The student? The writer has given up most of his leisure for some 15 years in the belief that if anatomical terminology were set on a proper basis it would greatly "facilitate the progress of study" by removing much of the "rubbish that obstructs the journey." A sound knowledge of anatomy oils the wheels of the medical curricle. Besides, why make the student a terminological inexactitudinarian?

The teacher? The more "rubbish" removed and the less wearisome the labour of the student the easier will be the task of the teacher.

The patient? The sounder the anatomical knowledge of the graduate the better for the patient. The student need not devote his whole course to anatomy, nor need he be kept from graduating until he can enumerate the branchlets of every artery in order and at breakneck speed. He should, however, be given a sporting chance of acquiring in the time at his disposal a serviceable and lasting knowledge of the human body.

There is probably no change suggested above against which objections could not be brought. It is always so much easier to pull down than to build. At one time it is hard to find a suitable term, at another hard to choose the best of several, and so on. Moreover, everything is contingent. One can only make suggestions. The writer has studied the problems involved in the naming of almost every structure in the body, and he believes that if only a definite nucleus were provided the whole terminology would crystallise out. In these strenuous days one cannot devote a lifetime to the complete solution and exposition of a problem the practical issue of which depends entirely on others; but if the authorities responsible for anatomy and for medicine and surgery in general should think the time opportune for revision, the writer, were he able in any way to help, would feel more than repaid for the loss of the leisure of years. Anatomy is among the most precise of sciences. Why should she not lead the way in the science of terminology?

HOSPITAL FUNDS IN BELFAST.—It is announced that a sum of £6000 has been allocated to Belfast by the management of the United Services Fund, of which £1500 is to be given to the Royal Victoria Hospital, £1200 to the Mater Infirmorum Hospital, the balance to be divided among the Children's and other hospitals in Belfast, after deducting £750 to be devoted to the funds of the "Comrades of the Great War" Club. This announcement was made on August 20th at a meeting of the committee in charge of the Hospital Gala Sports Fund, the object of which is to raise £10,000 for hospital institutions in Belfast.

PUBLIC HEALTH IN SOVIET RUSSIA.

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I.—EPIDEMIC DISEASE.

THE visit of the British Labour Delegation to Russia extended from May 10th, when we entered that country at the Russo-Esthonian frontier (near Narva), to June 15th, when we recrossed it on our return. During that period I visited Petrograd for a few days and Moscow for about a fortnight. From Moscow we went to Nijni-Novgorod, on the Volga, where we embarked on a beautiful Volga steamer, the s.s. *Bielinski*, and with the red flag of the Republic, with its R.S.F.S.R. printed in bold letters across its width, fluttering at the prow, sailed down to Astrakhan, on the Caspian Sea, returned thence to Saratoff, and so back by train to Moscow, Petrograd, and out to Esthonia.

During the time I was in Russia I was able to see hospitals and other medical institutions in Petrograd, Moscow, Saratoff, Astrakhan, and other places (small towns and villages on the Volga), and see them in freedom. I talked freely with medical men and women, sometimes in English, more often in French, and even occasionally I stuttered a little German. Only a few doctors are definitely Communists, but practically all doctors (like all others, in fact) are working for the Communist Government. The medical service in Petrograd is under the direction of Dr. Pervouchen; the medical service of the whole of Russia and Siberia, civilian and military, is under the medical control of the Minister of Health (called in Russia the Commissar of Public Health), Dr. Semasko, whose headquarters are at Moscow.

Dr. Semasko is a man of about 43 years of age with a serious, kindly face, a simple and courteous manner, and a real grip of the work he has in hand. Dr. Semasko is a Communist by party, but he is, of course, a man of trained scientific mind, a mind which tries to see facts as they are; he does not wish to exaggerate or to conceal facts. He spoke to me and to my friends with an admirable directness and precision. Some of our conversations were carried on in French and some (for the benefit of those not understanding that language) in Russian through an interpreter chosen by the Labour Delegation from among a non-Communist political group. My notes of conversations were made at the time, and I was supplied also with answers to a questionnaire I put in, and with copies of the official reports published by the Commissariat of Health.

Health Conditions: Absence of Necessities.

There is no doubt that the health conditions in Russia are extremely bad. Great epidemics of cholera, typhus, relapsing fever, Spanish influenza, and minor epidemics of other diseases have occurred, but all have been vigorously combated by the health authorities. Despite the handicap of an almost complete absence of soap, disinfectants, and drugs of all kinds, good work has been done. The figures quoted are those given to me officially, and although one cannot pretend that they are very accurate (registration and notification cannot be relied on), they are sufficiently accurate to give a clear idea of the extent of the epidemics. The population of Russia and Siberia is now estimated at 125,000,000, as the Baltic States and Poland are cut off on the West, and the Far Eastern Republic is the new boundary to the east of Lake Baikal. The whole of the rest of the area of Russia and Siberia, with the exception of Georgia in the south, is one country for practical purposes, although there are political differences in regard to the degree of nearness of affiliation of the Azerbaijan Republic, Turkestan, and so on.

In 1918 there was an epidemic of *cholera* reaching 35,619 cases, which should be compared with the previous epidemic of more than 200,000 in 1908. Credit for this limitation is certainly due to the Commissariat of Health. In 1918 also over 700,000 cases of Spanish *influenza* were registered and a special research instituted to study this disease, the report of which is expected shortly.

Measures taken against Typhus.

In the autumn of 1918 *typhus* appeared in epidemic form and became more widespread in the spring of 1919. 1,299,262 cases were registered in the eight months up to July, 1919, with a death-rate of 8 to 10 per cent. This epidemic particularly affected the cities where food conditions were worst. The typhus died down during the summer, but broke out again in October, November, and December, 1919, the increase coinciding with the advance of the Red Army into Siberia, all the districts evacuated by Koltchak being infected. When the epidemic died down in the East, after heroic measures of burial of corpses and disinfection had been undertaken, it broke out again in the south, again coinciding with the advance of the army into an infected region occupied by Denikin.

DR. SEMASKO,
Commissar of Public Health for all Russia and Siberia.

The measures taken to combat the disease were as follows:—

(1) Cleanliness campaign in army, in towns and in villages by posters and handbills, and by enlisting groups of men, and particularly women, as volunteers to pay house-to-house visits as a propaganda of cleanliness. Much magnified pictures of the louse greet one in public places with sentences such as "The louse is the enemy of the Revolution," and simple explanations of the danger of these parasites. At Petrograd at a theatre where I happened to go the programme contained a note on the danger of lice and instructions to leave the hairy peasant coats a good many people wear in the cloak-room. "Cleanliness weeks" are used as concentrated propaganda, and everyone has to clean and scour, soap being then provided.

(2) One hundred and twenty-five control stations have been established on the railway lines in East and Central Russia providing for disinfection (by steam or formalin or sulphur, but not adequate), for medical inspection, removal of suspicious cases, a bath, hair cut with clippers, and a change of linen. The latter, however, was very difficult to provide. Doctors are always in attendence at these control stations. Total capacity of control stations 6578 per diem. Hospital accommodation is provided near the control stations.

(3) Provision of a special coach on each train for the reception of suspicious cases or definitely diagnosed cases of typhus. This applies to every line in Russia and Siberia.

(4) Medical inspection of military and civilian passengers at railway junctions.

(5) Provision of baths for army at the front—140 in all, with a daily capacity of 148,000 persons. These baths are arranged with entrance-room, washing-room, and dressing-room in three compartments to avoid reinfection. Most baths are of douche type, but some are slipper.

(6) Provision of baths for civilians. (A simple bath-house is common in peasant houses, and a weekly bath is customary.)

Generally speaking, there is enough public bath accommodation in the big towns, capitals of provinces (Gubernias) and their district subdivisions, but only one public bath as a rule for a group of two or three villages (Volost).

An Estimate of their Efficacy.

The figures of typhus for this year enable one to form an estimate of the effect of these measures.

Typhus in All Russia and Siberia in 1920.

(a) *Civilians*—		(b) *Army*—	
February	389,858	January...	66,113
March	313,624	February	75,978*
April	158,308	March	57,251
May	28,000	April	16,505

* Invasion of South—Denikin contacts.

When I visited hospitals in Petrograd, Moscow, Saratoff, and other places there were still large numbers of cases under treatment, but they were diminishing. Dr. Semasko told me that practically every town and village in Russia was infected, and I certainly found this was so at the numerous places where I inquired. A typical example of the condition of affairs was at Beresnaki, on the Volga, a place visited on June 2nd, 1920, and where I went over the hospital entirely on my own initiative. The population of the village was 13,000 (villages in Russia are large agglomerations of people), the hospital was of about 80 beds, a clean, well-kept place. I saw 20 typhus cases in the wards (June 2nd, 1920), about half men and half women. Careful precautions as to wearing a special long gown were insisted upon before entering the wards. The doctor told me there had been about 1000 typhus cases in the village in the winter and about 2000 in the surrounding district. Only 250 were provided with hospital accommodation. This village is in the Saratoff Province, and the doctor (who had had typhus) informed me that 14 per cent. of the doctors of the province had died from the disease. The figures given me in this village probably refer to typhus and to relapsing fever combined, and may include a few typhoid cases as the Russians use the term typhus in common for these three maladies, adding exanthematicus, recurrens or abdominalis.

The figures given me by Dr. Semasko for Russia and Siberia are for typhus only, but an approximately equal number of cases of relapsing fever occurred. There are, however, not (comparatively) many cases of typhoid fever. In Petrograd in May there were about 30 to 40 civilian cases of typhus a day, and about the same number of military cases. The figures for the week May 1st to 7th supplied to me by Dr. Pervouchen from his weekly return (interview May 13th) were typhus 363 cases, relapsing fever 69 cases, typhoid 7 cases. There were also 13 cases of small-pox and 54 of Spanish influenza, as well as other infections in smaller numbers—viz., very acute enteritis 8, dysentery 10, erysipelas 9, measles 2, scarlet fever 2, diphtheria 2. The cases to which these figures refer were those removed to hospital only.

Cholera.

The epidemic in 1918 has already been referred to and in 1919 there were only a few cases. In January of this year there was cholera in 10 places, chiefly in the South of Russia. In one of these, Saratoff, on the Volga, there were 26 cases, in all the others there were 430 cases. By March the number of cases had fallen to 216. The day I left Moscow, May 14th, I heard (not officially, however) that there were 100 cases of cholera in the town. Vivid picture propaganda showing the path of infection of cholera in its different stages—the sick man, washing of linen in river, drinking of unboiled water, &c.—was to be seen very frequently, and the poster was easy to understand whether one could read the words or not. It is to be sincerely hoped that there is not a severe epidemic this summer, as with the increased traffic on the Volga now that fighting with Denikin is over it will spread much more easily. Also the way is now open to the east viâ the Caspian Sea.

Small-pox.

From Nov. 1st, 1918, to July, 1919, there were 81,851 cases registered. In December, 1919, there were 147 cases; January, 182; February, 149; March, 72. Vaccination was made compulsory by decree on April 16th, 1919, and carried out extensively. The Commissariat of Public Health claims to have abolished the disease.

There has been no especially severe epidemic affecting children, and only an occasional sporadic case of plague has occurred, originating from the endemic centre on the Steppe to the east of Astrakhan. Tuberculosis has increased, syphilis has very much increased, especially in the south, where the country has been traversed by invading armies.

(To be continued.)

VIENNA.

(FROM OUR OWN CORRESPONDENT.)

Austrian Physicians in Russian Captivity: Projected Exchange.

A CONSIDERABLE number of physicians and surgeons hailing from the districts of present-time Austria are still prisoners of war in Siberia. These unhappy men, many of them captured as early as 1914–1915, were never allowed the privilege of returning home when their hospitals were broken up, but they had to continue their work in other parts of the vast country. Even after the formation of the new states by the upheaval of the old Austro-Hungarian Empire, these purely Austrian doctors had to do service amongst Czecho-Slav, Hungarian, Yugo-Slav, or Italian prisoners of war in Asia, whilst medical officers of these nations were sent home. The medical organisation of Vienna has taken up the matter, and has appealed to the profession for volunteers to change places with the men absent from home and family for so long. About 220 men are needed for exchange, which, for political reasons, has hitherto been impossible. It appears that the obstacles have now been removed, and those doctors who have volunteered to go abroad and relieve their homesick brethren have been advised to keep themselves ready for departure at short notice.

American Physicians' Grants for Austrian Physicians.

Professor Pirquet, head of the pædiatric clinic in Vienna, formerly a Johns Hopkins professor at the University of Baltimore, has received from an American Relief Committee consisting of practitioners a cheque for $10,000, to be spent on distributing articles of food to University lecturers and theoretical teachers of medicine in Vienna. Professor Pirquet has fulfilled this wish, at the same time making the grant a means of a scientific research. All persons applying for a gift from this grant were examined as to their nutritional condition according to the "nem" system[1] of Pirquet. It was found that on an average children of the applying families lacked 1–3 kilonem (1000 nem), adults 2–3 kilonem daily in the quantity of food allotted to them by the State and obtainable by the food-tickets. The deficit was provided from the American grant. On an average each family received 154 kilonem per month, and the quantity of food for disposal was estimated as sufficient to last four months. Two hundred families were thus assisted, and after three months exact weights and measurements were taken. It was found that 128 families showed increase of weight, ranging from 4 kg. to 8 kg. per person—proving how greatly

[1] Nutritional value of 1 g. of milk.

underfed these families were. In one case of a family —a father, mother, and two children—the increase was uniform, being 3·3 kg. each after two months only. The food distributed consisted chiefly of white flour, rice, lard, corned beef, and condensed milk in tins. Pregnant women, as well as wet-nurses, received an extra ration of five tins of milk per month. In this way the $10,000 were made to serve the real object for which they were collected.

Increase of Females in the Higher Schools.

The reports of the Board of Schools for the last half year shows a constant increase in the number of girls entering the so-called middle schools, or gymnasia, where Latin and Greek are taught as a preliminary to the examinations for university study. Whilst the boys are taking up more practical vocations—there was a drop of 8 per cent. in the male entries to these schools last year—girls seem to be more and more willing to take up a university career, and their entry has increased by 40 per cent. We have now co-education here, boys and girls being taught in the same class-rooms, and the teachers assert that the girls are much more bright and alert than the masculine material the teachers are dealing with at present. This observation should be read along with the account of under-feeding. The increase of female medical students, as well as students of chemistry, has been noteworthy during the last two years.

August 18th.

NOTES FROM INDIA.

(FROM OUR OWN CORRESPONDENT.)

The Indian Red Cross.

AT the outbreak of the war no Red Cross organisation as such existed in India. Red Cross work was carried on, in addition to its normal activities, by the St. John Ambulance Association in India until August, 1916, when the Indian Branch of the Joint War Committee was established on the model of the Joint War Committee in England, being a combination of the British Red Cross Society and the Order of St. John of Jerusalem. At this time the combined associations had no separate funds, but were relying on moneys collected by the St. John Ambulance Association and on grants made by the Joint Committee in England. The administrative importance of the Indian Branch of the Joint War Committee was duly recognised in 1917. Collections resulting from "Our Day" appeal enabled relief to be sent to Mesopotamia, East Africa, Egypt, and latterly to the North-West Frontier of India. It is proposed to devote the balance of the funds to the relief of sickness in civil life. The Indian Red Cross Society, which has just come into being, occupies the same position as that of the British Red Cross in the International League of Red Cross Societies. It was considered advisable for the Joint War Committee, which had the backing of all shades of responsible Indian opinion, to establish an independent Indian Red Cross Society, with branches in every province and with functions expanding beyond war work in coöperation with the work of the St. John Ambulance Association and Brigade. With a view to widening as far as possible the field of useful work opening to the Indian Red Cross Society and to the provincial branches the Indian Red Cross Act legalises affiliation with bodies having cognate aims and objects.

Leper Menace in India.

A report has been issued on the work accomplished in India last year by the Mission to Lepers. It is very encouraging, the appeals to Indians having met with substantial support. During the year a number of lepers were discharged from the homes as symptom-free. It is too early to say if they are cured, but there is hope for early cases if they persist in the treatment. The introduction of the Bill for the amendment of the Leper Act marks an epoch in the attitude of the Indian Government to the leper. It is hoped that this measure will be passed during the ensuing session, as its urgency is universally admitted. The original Act provides for the segregation of pauper lepers and control of those following certain callings. In practice it is a dead letter. It has proved of little service, since the police, whose duty it is to take pauper lepers before a magistrate, do not like touching persons suffering from leprosy. Again, a leper in an asylum may leave when he likes. He cannot be detained after his open sores are healed, though he is still a leper and a potential danger to the public. Under the new Bill it will be possible for provincial Governments to segregate compulsorily begging lepers in settlements where they can be carefully looked after and their disease treated by the most modern methods.

Child Welfare in India.

The success attained by the Child Welfare Exhibition at Delhi has been repeated in various other Indian towns where similar entertainments have been organised. It is worthy of record that the total number of persons who visited Delhi were over 50,000, of whom 40,000 were women. These women were drawn from all classes, and their interest was most gratifying to those who assisted in organising the exhibition. The attendance at the women's lectures was so large that it was necessary to charge a small fee to prevent overcrowding. There were 1500 entries for the baby show.

Calcutta Water-supply.

Calcutta has been suffering acutely from a deficient supply of unfiltered water. The old sanitary arrangement, in which the "Mehlei" played so important a part, has disappeared, and the householder is dependent upon the municipality for a supply of unfiltered water for flushing purposes. Much hardship has ensued from the fact that no unfiltered water was to be had on first storeys, and remonstrances were sent to the Water Department without result. It is now announced that the Calcutta Corporation Commissioners have adopted the scheme drawn up by Mr. R. St. George Moore for the improvement of the water-supply.

Sanitation in the Punjab.

The Punjab Sanitary Board has approved of several important drainage systems for the province, and is doing excellent work in organising sanitary effort of every kind and the diffusion of instruction in elementary hygiene throughout the Punjab.

MEDICINE AND THE LAW

Patent Medicines as an Investment.

A PILL manufacturer, summoned at Willesden for the non-payment of rates, complained—we have the authority of *Punch* for August 25th in saying so—that the pill trade had fallen on evil days; "no ex-Service men seem to require pills." The circular, however, received by a member of our staff from a firm of stock-brokers, offering shares in a company, the object of which will be to deal in "specifics" and "remedies," contains a reminder that "profits running into millions of pounds have been made in patent medicines." And the brokers go on to say that their investigations convince them that "huge dividends will be earned and paid on the small capital of £—," concluding that "no investment to-day can possibly offer better prospects." Possible investors may perhaps do well to bear in mind that the prospect of patent medicines as a source of huge dividends may be diminished by the Proprietary Medicines Bill, if it should become law in anything like its present form. How far the Act will affect the sale of proprietary medicines of a harmless character can hardly be foreseen. If it passes in its present form some diseases will be placed beyond the reach of the medicine vendor, and would-be remedies likely to cause injury to health will be removable from the proposed register by administrative order. The sale of medicines containing alcohol and dangerous but unscheduled drugs will also presumably be the subject of regulation and control. The advertising of medicines, not in themselves injurious, by methods of an objectionable character, and likely to mislead the purchaser, will also be stopped to a large extent. The use of fictitious testimonials, the advertisement of a medicine as being recommended by an unnamed medical

practitioner, or as being the invention or discovery of a doctor when this is untrue will be forbidden. Methods of this kind have in the past swelled the "huge dividends" of patent medicine vendors, and raised their profits to millions of pounds. *Punch*, in a poem based upon the pill-manufacturer's complaint, which we began by quoting, puts the matter thus:—

"
Meanwhile you'll understand that I, for one,
Refuse to buy your wares and eat them just for fun,"

which is the common-sense view.

Certificates under the National Health Insurance Acts.

The Minister of Health, acting upon the report of the Inquiry Committee of the London Insurance Committee, has ordered that £50 be withheld from the Exchequer grant to the committee, to be recovered under Article 33 of the Regulations from a medical practitioner on the London panel. This heavy fine is inflicted in the following circumstances. The practitioner had given certificates in the usual form, stating that he had examined the patient on the dates named in them in respect of a patient whom he had not in fact visited for some time. He was aware that the patient had returned to his home from an infirmary in October, 1919, and gave the certificates up to January, 1920, when the patient died. It was not disputed that the patient was during this period incapable of work, or that in the practitioner's opinion he could never be otherwise. The penalty is a heavy one, but it must be remembered that it was in the power of the Minister to remove the practitioner from the panel, and that to furnish a certificate at variance with the facts is not only a breach of the regulations, but is wholly unjustifiable in principle. A medical certificate of incapacity which states that a patient has been seen by the certifier is evidence from a trusted witness that he is alive and entitled to sickness benefit. A man may be certainly and inevitably dying, but the fact of his being beyond question alive is important, and if fraud is rare and difficult to perpetrate it is not impossible or inconceivable. One of the allegations made against our admittedly faulty system of death registration is that it does not effectively prevent burial without the presentation of the prescribed certificate, and that a certificate obtained for one person can thus be kept and used for another whose death has not been registered. Such fraud may be neither frequent nor easy, but in so far as it can occur, it would render possible the payment of sickness benefit in respect of a person who was dead. That no fraud should have been perpetrated or dreamt of by anyone in a particular case does not detract from the importance of certificates relating to sickness or death being absolutely accurate and trustworthy.

A Coroner on Expert Anæsthesia.

An inquest held lately upon the body of a young woman who died under chloroform was the occasion for interesting comment on the part of the coroner. The medical features of the case were not, so far as the scanty details available show, unusual and merely enforce the well-known lesson that anæsthetics have special danger in the presence of acute cellulitis of the neck. In the case in question the anæsthetic was administered by a casualty officer, and the coroner stated that owing to the dangerous nature of operation for cellulitis of the neck it would have been better if one of the visiting anæsthetists could have been in charge. This is a counsel of perfection. It is an unfortunate but unavoidable anomaly of hospital practice at present that many of the most dangerous and difficult subjects for anæsthesia fall into the hands of the less experienced administrators. They are subjects for emergency operation and have to be treated when the expert anæsthetists are away from the hospital. It can hardly be otherwise unless there is always at the hospital a resident anæsthetist, as there is at many hospitals a resident surgeon. Most of the great hospitals now do possess a resident anæsthetist, and often he is a man of wide experience compared with that of the other residents. Further progress may ensure the constant presence in large hospitals of an anæsthetist whose standing is on a par with that of the resident surgeon or physician.

URBAN VITAL STATISTICS.

(Week ended August 21st, 1920.)

English and Welsh Towns.—In the 96 English and Welsh towns, with an aggregate civil population estimated at nearly 18 million persons, the annual rate of mortality, which had been 9·9, 9·6, and 9·4 in the three preceding weeks, rose to 9·9 per 1000. In London, with a population of nearly 4½ million persons, the annual death-rate was 9·8, or 1·3 per 1000 above that recorded in the previous week, while among the remaining towns the rates ranged from 3·9 in Hornsey, 4·0 in Swindon, and 4·3 in Ealing to 15·4 in South Shields, 15·7 in West Bromwich, and 16·0 in Burnley. The principal epidemic diseases caused 204 deaths, which corresponded to an annual rate of 0·6 per 1000, and comprised 129 from infantile diarrhœa, 35 from diphtheria, 17 from whooping-cough, 16 from measles, 5 from scarlet fever, and 2 from enteric fever. Measles caused a death-rate of 1·6 in Wolverhampton, but the mortality from the remaining epidemic diseases showed no marked excess in any of the large towns. There were 2150 cases of scarlet fever and 1362 of diphtheria under treatment in the Metropolitan Asylums Hospitals and the London Fever Hospital, against 2106 and 1413 respectively at the end of the previous week. The causes of 27 of the 3394 deaths in the 96 towns were uncertified, of which 8 were registered in Birmingham, 4 in Liverpool, and 3 in South Shields.

Scotch Towns.—In the 16 largest Scotch towns, with an aggregate population estimated at nearly 2½ million persons, the annual rate of mortality, which had been 11·2, 11·1, and 12·3 in the three preceding weeks, fell to 10·8 per 1000. The 235 deaths in Glasgow corresponded to an annual rate of 11·0 per 1000, and included 11 from infantile diarrhœa and 1 each from scarlet fever and whooping-cough. The 75 deaths in Edinburgh were equal to a rate of 11·5 per 1000, and included 3 from scarlet fever and 2 from diphtheria.

Irish Towns.—The 106 deaths in Dublin corresponded to an annual rate of 13·3, or 0·2 per 1000 above that recorded in the previous week, and included 5 from infantile diarrhœa and 1 from whooping-cough. The 68 deaths in Belfast were equal to a rate of 8·6 per 1000, and included 4 from infantile diarrhœa and 1 from whooping-cough.

(Week ended August 28th, 1920.)

English and Welsh Towns.—In the 96 English and Welsh towns, with an aggregate civil population estimated at nearly 18 million persons, the annual rate of mortality, which had been 9·6, 9·4, and 9·9 in the three preceding weeks, was again 9·9 per 1000. In London, with a population of nearly 4½ million persons, the annual death-rate was 9·7, against 9·8 per 1000 in the previous week, while among the remaining towns the rates ranged from 3·7 in Edmonton, 3·9 in Hornsey, and 4·9 in York, to 16·8 in South Shields, 17·2 in Stockton-on-Tees, and 17·5 in West Hartlepool. The principal epidemic diseases caused 237 deaths, which corresponded to an annual rate of 0·7 per 1000, and comprised 150 from infantile diarrhœa, 34 from diphtheria, 23 from measles, 20 from whooping-cough, 9 from scarlet fever, and 1 from enteric fever. The deaths from infantile diarrhœa, which had been 87, 93, and 129 in the three preceding weeks, further rose to 150, and included 38 in London, 13 in Liverpool, 9 in Birmingham, and 8 each in Sheffield and Hull. There were 2266 cases of scarlet fever and 1391 of diphtheria under treatment in the Metropolitan Asylums Hospitals and the London Fever Hospital, against 2150 and 1362 respectively at the end of the previous week. The causes of 34 of the 3395 deaths in the 96 towns were uncertified, of which 8 were registered in Birmingham and 3 in Liverpool.

Scotch Towns.—In the 16 largest Scotch towns, with an aggregate population estimated at nearly 2½ million persons, the annual rate of mortality, which had been 11·1, 12·3, and 10·8 in the three preceding weeks, rose to 11·1 per 1000. The 270 deaths in Glasgow corresponded to an annual rate of 12·7 per 1000, and included 16 from infantile diarrhœa, 6 from small-pox, 2 from enteric fever, and 1 each from measles, scarlet fever, and whooping-cough. The 77 deaths in Edinburgh were equal to a rate of 11·8 per 1000, and included 2 from infantile diarrhœa and 1 from diphtheria.

Irish Towns.—The 122 deaths in Dublin corresponded to an annual rate of 15·3, or 2·0 per 1000 above that recorded in the previous week, and included 4 from infantile diarrhœa, 2 each from whooping-cough and diphtheria, and 1 from enteric fever. The 105 deaths in Belfast were equal to a rate of 13·3 per 1000, and included 8 from infantile diarrhœa and 1 each from scarlet fever and diphtheria.

THE **Médaille de la Reconnaissance Française** (argent) has been conferred by the President of the French Republic on Mrs. Bedford Fenwick, honorary superintendent of the French Flag Nursing Corps.

REGISTRABLE COLONIAL AND FOREIGN MEDICAL DEGREES.

UNDER the Medical Act, 1886, a number of medical diplomas granted in British possessions entitle their holders to be registered without further examination in the Colonial List of the (British) Medical Register. The condition attached to such registration is that the holder of the colonial diploma obtained it when he was not domiciled in the United Kingdom or in the course of a period of not less than five years during the whole of which he resided out of the United Kingdom. Some account is here given of these diplomas and of the course of study required to obtain them. The information has in most cases been supplied or confirmed by the authorities of the university or corporation, to whom our best thanks are offered.

AUSTRALASIA.

Summary of Registrable Degrees.—New South Wales: University of Sydney, (1) M.B., (2) M.D., (3) Ch.M. New Zealand: University of New Zealand, (1) M.B.; Ch.B., (2) M.D. South Australia: University of Adelaide, (1) M.B., B.S., (2) M.D., (3) M.S. Victoria: University of Melbourne, (1) M.B., (2) M.D., B.S.

University of Adelaide.

The University of Adelaide[1] was established by Act of the South Australian Legislature in 1874. In 1883 Sir Thomas Elder gave £10,000 for the foundation of a school of medicine. The Medical Acts of 1844 and 1880 set up a South Australian Medical Board to issue certificates of legally qualified medical practice.

Preliminary Examination.—Before entering upon the medical course candidates must have passed the Senior Public Examination in at least five subjects, and the higher standard in physics, chemistry, and biology, either of the Higher Public Examination or first year Science.

M.B., B.S.—The five years' course includes five examinations held in November of each year. At the first the subjects are anatomy and dissections, physiology, organic chemistry, and physical chemistry; at the second, anatomy, physiology, and materia medica; at the third, medicine, surgery (including clinical), regional and surgical anatomy, bacteriology; at the fourth, medicine (including clinical), surgery (including surgical anatomy and clinical surgery), pathology, obstetrics, and forensic medicine (including insanity); at the fifth, medicine (all branches), surgery (including surgical anatomy and operative surgery), gynæcology, ophthalmology, otology, therapeutics, and public health and preventive medicine. The fee for each examination is £3 3*s.* and for the degree £5 5*s.* Fees for the five years' course of study amount to £145 19*s.* There were 96 undergraduate students in 1919.

M.D.—Candidates must have been Bachelors for at least nine academic terms, which may be shortened on the recommendation of the Faculty of Medicine. The subject of examination may be selected from the following: General medicine, diseases of the nervous system, pathology, obstetrics, State medicine. A thesis may be submitted. Fee for the examination £15 15*s.*, for the degree £10 10*s.*

M.S.—The conditions are similar to those for the M.D. Choice of subject may be made from: Gynæcology, the surgery of the abdomen, the surgery of the special senses and throat; in addition to examination in the principles of surgery.

University of Melbourne.

The University of Melbourne[2] was incorporated by Act of the Victorian Legislature in 1853. The Medical Act of 1890, substantially amended in 1906, set up the Medical Board of Victoria to register legally qualified medical practitioners.

Preliminary Examination.—All candidates must possess the School Leaving Certificate, which is based on education in a secondary school during four years. The Intermediate Certificate must have been taken at least a year before the School Leaving. English is compulsory at the higher standard; Latin and geometry with trigonometry at the lower.

M.B., B.S.—The course extends over five calendar years, and is divided into two equal parts, hospital practice being confined to the second half. The first year (Division I.) is devoted to natural philosophy, chemistry, zoology, and botany; the remainder of the first half (Division II.) to anatomy and physiology. Two complete courses of dissections are compulsory. Hospital practice extends through Divisions III. and IV. The general hospitals ranking as clinical schools are the Melbourne Hospital, the Alfred Hospital, and the St. Vincent's Hospital. The recognised special hospitals include the Women's Hospital, the Children's Hospital, the Eye and Ear Hospital, the Infectious Diseases Hospital, the Receiving House, and Acute Mental Hospital. A full clinical curriculum is arranged, both general and special, with clinical lectures. In Division III. (lasting one year) courses of lectures are given in pathology (with practical work in histology and in bacteriology), in therapeutics, public health, materia medica and pharmacy, and regional and applied anatomy, and examination in all these subjects follows immediately. In Division IV., lasting a year and a half, systematic lectures are confined to the first year and include medicine, surgery, and forensic medicine. Lectures on obstetrics and gynæcology are given in Division III., but the examination in these subjects is postponed till the final at the end of the course, which also includes the subjects of Division IV. Clinical medicine and clinical surgery rank as separate subjects in the finals.

Honour examinations with exhibitions are held in all subjects of Divisions I., II., and III., and there is a final honour examination with scholarships in medicine, in surgery, and in obstetrics and gynæcology.

The yearly fee payable to the University is £23, with a sports fee of 1 guinea and a club-house fee of 1 guinea. The hospital and pharmacy fees in Divisions III. and IV. amount to £69 6*s.* The total fees are £194 16*s.* The degree fee for M.B., B.S., is 7 guineas.

The number of students for the full course now in attendance is 732. Provision is also made for instruction to dental students, massage students, single subject students, &c.

M.D.—Candidates must be Bachelors of Medicine of two years' standing. They may proceed either by thesis or by examination. The thesis must be a substantial contribution to medical knowledge. The examination includes medicine, with either obstetrics and medical gynæcology, or diseases of children, or diseases of the nervous system, including insanity. Subject to a dispensing power in the case of theses of great merit, all candidates must pass an examination in clinical medicine. The fee for examination and degree is 10 guineas.

M.S.—Candidates must be Bachelors of Surgery of two years' standing. Part I. of the examination includes surgical anatomy and surgical pathology. Part II. includes surgery in all branches. The two parts may be taken together or separately. No candidate can pass in Part II. who has not passed in Part I. The fee for examination and degree is 10 guineas.

Diploma of Public Health.—Granted under conditions agreeing with those in the United Kingdom. Fees for instruction are 32 guineas, apart from fever hospital practice. The fee for examination is 10 guineas, for diploma 3 guineas.

Diploma of Tropical Medicine.—Candidates must be qualified medical practitioners, and must have passed Part I. for D.P.H. or have undergone a special training in lieu thereof. They are trained in tropical medicine at the Australian Institute of Tropical Medicine, Townsville, Queensland, having a three months' course of theoretical and practical instruction, followed by a three months' clinical course in the Townsville Hospital. The examination is conducted at the institute. Fee for preliminary course is £2 2*s.*; for course at institute, 10 guineas; for examination and diploma, 5 guineas.

Affiliated Colleges.—Trinity College (1872), Ormond College (1879), Queen's College (1888), and Newman College (1918) are affiliated to the University and have medical tutors.

[1] The University Registrar is Mr. C. R. Hodge. The Calendar of the University of Adelaide (1920) is a volume of 534 pp., printed by W. K. Thomas and Co., Grenfell-street, Adelaide. Price 2*s.* 6*d.*

[2] The University Registrar is Mr. J. P. Bainbridge, J.P. The Melbourne University Calendar (1920) is a volume of 1111 pp., printed for the University by Ford and Son, Drummond-street, Carlton, Melbourne. Price 3*s.*

University of New Zealand.

The University of New Zealand was established by Act of the New Zealand Legislature in 1870. The Medical Act of 1908 provided for the registration of medical practitioners. The University has no fixed home or buildings; it is an examining body with four affiliated colleges—namely, University of Otago, Dunedin; Canterbury College, Christchurch; Auckland University College; and Victoria University College, Wellington. The degrees of M.B., Ch.B., M.D., and B.D.S. are conferred, and the subjects of study are Biology, Physiology, Medicine and Surgery, Ophthalmology, Chemistry, Bacteriology and Public Health, Anatomy, Pathology, Midwifery and Gynæcology, and Dentistry. The agent in England is J. W. Joynt, Esq., M.A., 11, Torrington-square, London, W.C. 1.

University of Sydney.

The University of Sydney [3] was incorporated by Act of the New South Wales Legislature in 1850. The Medical Practitioners Act of 1898 provides for the registration of legally qualified medical practitioners.

Matriculation Examination.—Latin and another language other than English are required, one at the Higher standard.

M.B., Ch.M.—The course of study extends over a period of five years. Five degree and a final examination are held: (1st year) in physics, chemistry, botany and zoology; (2nd year) in anatomy and physiology; (3rd year) in the entire subjects of anatomy and physiology, every part of the body having been dissected at least once; (4th year) in pathology, surgical anatomy and operative surgery, materia medica, and therapeutics: (5th year) in medical jurisprudence and public health; (final) in medicine, surgery, obstetrics, and gynæcology. Certificates of proficiency in vaccination and anæsthetics are required. The fee for each degree is £10. The number of students attending degree courses during 1919 was 876—783 men and 93 women.

M.D.—Candidates must, after obtaining the degree of Bachelor, have spent at least two years in medical or surgical practice or in approved study. Examination is written or oral in one of the following subjects: medicine, medical jurisprudence and public health, surgery, obstetrics and gynæcology; or in any of the scientific subjects included in the medical curriculum. A thesis must be presented two months before the examination. The fee for the degree is £10.

Diploma in Public Health.—Candidates must be registered practitioners of not less than 12 months' standing. The examination is in two parts: (1) relating to the general principles of sanitary medicine; (2) relating to State medicine and to the applications of pathology and sanitary science to public health. The fee is £10.

Affiliated Colleges.—Matriculated students are admitted to the following resident colleges—namely, St. Paul's College (Church of England), St. John's College (Roman Catholic), St. Andrew's College (Presbyterian), Wesley College (Methodist), the Women's College (undenominational), at which scholarships and bursaries are available.

Recognised Hospitals are the Royal Prince Alfred Hospital with medical school, the Sydney Hospital with clinical school, St. Vincent's Hospital, the Royal Hospital for Women, the Royal Alexandra Hospital for Children, the Glandesville and Callan Park Hospitals for the Insane, the Women's Hospital, the Renwick Hospital for Infants, and the South Sydney Hospital for Women.

BRITISH NORTH AMERICA.

Summary of Registrable Degrees and Diplomas.—Alberta: College of Physicians and Surgeons, Member. Manitoba: College of Physicians and Surgeons, Member; University of Manitoba, M.D., C.M. New Brunswick: Provincial Council of Physicians and Surgeons, L.M.S. Newfoundland: Medical Board, L.M.S. North-West Territories: College of Physicians and Surgeons, Member (when held in conjunction with the licence of Alberta or Saskatchewan). Nova Scotia: Provincial Medical Board, L.M.S.; Dalhousie University, M.D., C.M. (Halifax Medical College, M.D., C.M., if obtained prior to August 31st, 1911). Ontario: College of Physicians and Surgeons, Member. (To this can be added as additional qualifications the degrees in medicine of the Queen's University, Kingston; the Western University, London; and the University of Toronto.) Prince Edward Island: Medical Council, L.M.S. Quebec: McGill University, M.D., C.M.; Laval University, M.D. Saskatchewan: College of Physicians and Surgeons, Member.

Dalhousie University, Halifax, Nova Scotia.

The work of Halifax Medical College was discontinued in 1911, when instruction in all subjects of the medical curriculum was undertaken by Dalhousie University. The professional examinations are conducted conjointly by the university and the Provincial Medical Board of Nova Scotia (see below).

M.D., C.M.—In addition to the matriculation or preliminary examination candidates are required to pass five professional examinations. For admission to the classes of the third or any higher year the undergraduate must have passed in all the subjects of the preceding year. The curriculum for the third year still includes practical anatomy and advanced physiology, while the fifth (final) year subjects are given as: Surgical anatomy, operative surgery, clinical surgery, clinical medicine, clinical pediatrics, clinical obstetrics, practical obstetrics, clinical gynæcology, mental diseases, skin diseases, eye, ear, nose and throat diseases, dressing, clerking, vaccination, post mortems, hospital, medical ethics. To win distinction in any subject a mark of 75 per cent. or over is required. The total tuition fees in any year amount to $125, with $10 additional for the third, fourth, and fifth years. The fee for each examination is $10. There were 160 medical students of all years in 1919–20. Dean of the Faculty, John Stewart, M.B. Edin., LL.D. Edin. and Dal.; Secretary, Professor Fraser Harris, M.D., D.Sc.

Queen's University, Kingston, Canada.

Queen's College, Kingston,[4] was established by Royal charter in 1841, assisted by grants from the Presbyterian Church in Scotland. Classes in medicine were first held in the University in 1854. The Medical School, conducted for a time under the charter of the Royal College of Physicians and Surgeons at Kingston, became an integral part of the University in 1892. Kingston General Hospital (230 beds) is adjacent to the University buildings.

M.D., C.M.—Candidates for a degree must pass the Junior Matriculation of the University or its equivalent. The course comprises five sessions of eight months each. A combined B.A. and M.D. course may be taken in seven years. Foreign students must spend at least one full session in the University. Examinations are held at the end of each session. The average cost per session of eight months, including board and lodging, is $376–$435. All students are expected to attend a church of the denomination to which they profess to belong.

D.Sc.—Granted on a thesis embodying original research of importance to medical science not earlier than two years after graduation. A reading knowledge of scientific French and German is required.

D.P.H.—The diploma is granted to those holding the M.D., or M.D., B.Sc., after examination following prescribed study, which includes six months with a recognised medical officer of health in the study of practical sanitation.

Laval University, Quebec.

Laval Catholic University [5] was incorporated by Royal Charter in 1852, absorbing the Quebec School of Medicine organised four years earlier. The first class graduated in 1855.

M.B., M.D.—The entrance examination includes Latin, philosophy, and Canadian history, and its standard is prescribed by the College of Physicians and Surgeons of Quebec. The Faculty of Medicine confers a baccalauréat and a doctorat, the former after 2 years, comprising 6 terms of study, the latter after 3 further years. Examinations are held in June at the end of each year of study. The total fee for examinations is $15, for the diploma of bachelor $5, and for that of doctor $20. Fees paid by enrolled students for the medical course amount to $45 a term.

[3] The University Warden and Registrar is Mr. H. E. Barff, M.A. The Calendar of the University of Sydney (1920) is a volume of 740 pp., printed for the University by Angus and Robertson, Ltd., Sydney. Price 2s. 6d.

[4] The Secretary of the Medical Faculty is Dr. A. R. B. Williamson, Queen's University, Kingston, Ont.

[5] The Medical Department of Laval University was destroyed by fire on Nov. 24th, 1919, and is now in process of rebuilding. The Secretary of the Medical Faculty is M. Arthur Vallée.

McGill University, Montreal.

The Faculty of Medicine of McGill University[6] arose out of the Montreal Medical Institution, organised as a medical school in 1823–24, and incorporated in the University in 1829.

Preliminary Examination.—Before registration an undergraduate in medicine must have passed the Matriculation Examination of the University or its equivalent. The examination is held twice yearly at McGill, and once at Calgary, Regina, Winnipeg, Toronto, St. John, and Truro. Also in June in London (apply to Secretary, Headmasters' Conference, 12, King's Bench Walk, E.C.). Latin, and either Greek, French, or German must be taken. Every student entering the University is required to pass a physical examination to detect defects and weaknesses amenable to treatment. Board and lodging can be obtained in private houses in the vicinity of the University at $40 a month upwards.

M.D., C.M.—The undergraduate course in medicine has this year been increased to six years by a pre-medical year devoted to chemistry, physics, and biology, with English and one modern language. This readjustment gives a final year confined to hospital work, including medicine, surgery, obstetrics, gynæcology, ophthalmology, oto-laryngology, pathology, and dermatology. The third year now embraces anatomy (neurology), physiology, general pathology, bacteriology, chemistry (physiological and clinical), parasitology, pharmacology, and clinical microscopy. During this year students begin to visit the hospitals and receive instruction in small groups in the elements of clinical medicine and clinical surgery. Examinations are held in the subjects of each successive year. The total faculty fees for the medical cour e of six years are $1200, payable in twelve instalments of $100 each. The degree fee is $30. 624 medical students were enrolled in the session 1919–1920.

D.P.H.—This course, cancelled during the war, has now been resumed.

New Brunswick, Council of Physicians and Surgeons

The Council of Physicians and Surgeons of New Brunswick is empowered by the Medical Act to issue a licence (L.M.S.) conferring the legal right to practise. The usual matriculation examination is required and the graded collegiate course comprises five sessions of not less than eight months each. The examinations are held twice a year at St. John, N.B., the fee being $30. Candidates may appear for the primary examination at the end of the second year of study. The fee for the licence is $3 and the registration fee $40. The registrar of the council is Dr. S. Skinner, 64, Charlotte-street, St. John, N.B.

Nova Scotia, Provincial Medical Board.

A licence (L.M.S.), legally entitling to practise, is issued by the Provincial Medical Board of Nova Scotia to those who have satisfied requirements in respect to preliminary and professional education. After registration in the Medical Students' Register (fee $25) a course of at least five full years in medicine must be taken. Graduates of medical schools recognised by the Board who can submit satisfactory schedules of studies are admitted to the third (final) professional examination (fee, including registration, $75). All applicants for registration must take this examination except licentiates of the General Medical Council of the United Kingdom and of the Medical Council of Canada, who are admitted to registration without examination upon payment of a fee of $50. The registrar of the Board is Dr. W. H. Hattie, Halifax, N.S.

University of Toronto.

The University of Toronto,[7] Ontario, took its title in 1849, a Royal Charter having been granted in 1827. The Faculty of Medicine was re-established in 1887 under the Federation Act. Victoria College (1892), Trinity College (1904), and St. Michael's College (1907) are integral parts of the University.

Preliminary Examination.—The matriculation certificate of the University is required from entrants unless they are graduates in Arts of a Dominion or British University or possess a certificate of entrance into the Faculty of Education.

M.B.—The undergraduate course has just been lengthened to six years. Six examinations are taken in succession at the end of the session. The early years aim at giving such a training in sciences as is now exacted of those who desire to obtain a British as well as a Canadian qualification. During the third year an attempt is made to bridge the gap between the primary scientific and the final clinical subjects by taking up anatomy and physiology at the same time as surgery and medicine throughout the year. Preliminary courses in pathology and pathological chemistry are taken; instruction is given in pharmacology; and a series of ten lectures delivered on psychology. The final year includes courses on anæsthesia, dentistry, medical ethics, history of medicine, and life insurance. The annual fee for regular students with one annual examination is $150. Combined courses of B.A., M.B. and B.Sc., M.B., lasting seven years, are also arranged. Honour standing can be obtained in each year's subjects. There is residence for about 150 men and three houses near to the University. Each male student proceeding to a degree must take physical training, the character to be determined by medical examination in the first two years of his attendance.

M.D.—One year must elapse after obtaining the M.B. degree and an approved thesis submitted.

D.P.H.—Candidates must be graduates in medicine of this or some other University. The curriculum extends over a winter session of eight months and a summer session of three months. The fee for the course is $150 and for the diploma $20.

NEAR EAST.

Registrable Degrees.—University of Malta, M.B., Ch.B., M.D., Ch.M.

University of Malta.

The University of Malta was added in 1898 to the list of institutions recognised by the English Royal Colleges. Study in the Faculty of Medicine and Surgery[8] is open to matriculated students who have attended a three years' preparatory course in the Faculty of Science. Matriculation includes English, Italian, and Latin, while history is also necessary to comply with the G. M. C. regulations. The preparatory course in science in its third year comprises English or Italian literature, physics, organic chemistry, and human anatomy and general histology, with dissection. Medical botany is taught at the Botanic Garden. The academical course of medicine and surgery (*M.B.*, *Ch.B.*) extends over four years, the first year being devoted solely to anatomy and physiology, and the final year including clinical medicine, surgery, and midwifery, along with skin diseases, mental diseases, operative surgery, and forensic medicine, and continued attendance at the clinical laboratory and the hospital. The degree of *M.D.* or of *Ch.M.* is conferred on any M.B., Ch.B. on passing an examination at not less than one year after graduation, in each case with an approved thesis. The fee for any of the three degrees is £6.

FAR EAST.

Summary of Registrable Degrees.—Ceylon: Medical College, L.M.S. Hong-Kong: University of Hong-Kong, M.B., B.S. India: University of Allahabad, M.B., B.S.; University of Bombay,[9] (1) L.M.S., (2) M.B., B.S., (3) M.D., (4) M.S.; University of Calcutta, (1) L.M.S., (2) M.B., (3) M.D., (4) M.S., (5) M.O.; University of Madras,[10] (1) M.B., M.S., (2) M.B., B.S., (3) M.D.; Punjab University, (1) L.M.S., (2) M.B., (3) M.D., (4) M.S. Straits Settlements: King Edward VII. Medical School, Singapore, L.M.S.

University of Allahabad.

The examination for the degree of *M.B.*, *B.S.* consists of three parts: preliminary scientific, first degree, and final degree. The two latter are held at Lucknow. The preliminary scientific examination in chemistry, physics, and biology is open to candidates who have passed in these subjects at the intermediate examination of the University. The first degree examination comprises anatomy, physiology,

[6] The University registrar is Mr. J. M. Nicholson, M.A. The registrar of the Faculty of Medicine is Dr. J. W. Scane. The Annual Calendar of the Faculty of Medicine and Department of Dentistry is a volume of 90 pp., printed by the Gazette Printing Co., Ltd., Montreal.

[7] The Secretary of the Faculty of Medicine is Dr. E. S. Ryerson.

[8] Statute of the University of Malta, 1915, Government Printing Office, Malta, price 1s.

[9] If obtained after June 25th, 1912, the degree must have been registered in the Presidency.

[10] If obtained after June 1st, 1916, the degree must have been registered in the Presidency.

and materia medica and pharmacy; it may be taken after two years. The final degree examination comprises two groups: (A) midwifery, hygiene, and medical jurisprudence, taken after two years; (B) medicine, surgery, and pathology, taken a year later. Honours may be obtained in any subject. The *M.D.* and *M.S.* degrees are obtained within not less than one year on passing an examination in medicine and pathology. The fees for the M.B., B.S. examination are Rs.140, for the M.D. and M.S. Rs.200 each.

King George's Medical College, Lucknow, prepares students for the medical degrees of the University of Allahabad. The curriculum extends to five college years, each of three terms. Scholarships and bursaries are granted.

University of Bombay.[11]

Candidates for the *M.B.*, *B.S.* must have passed the first year arts examination or its equivalent, and be engaged during five University years in professional study at a medical college recognised by the University. Three examinations are held: the first, or preliminary scientific; the second, or intermediate; and the third, or final; each of them twice in the year. The two former are of the usual character. The final is divided into two parts, which may be taken together or separately two years after the intermediate. Part I. includes medicine, medical jurisprudence, pathology, and hygiene; Part II. surgery, midwifery, and ophthalmology. 561 medical undergraduates passed examinations in 1919–20. Candidature for the degrees of *B.Hy.*, *M.D.*, *D.Hy.*, or *M.S.* implies that the M B., B.S. degree has been taken not less than three years (B.Hy., one year) previously.

Grant Medical College, Bombay, was established in 1845, to "teach the system of Western medicine and to extend the benefit of Western medical instruction to the Natives of Western India," and recognised by the University in 1860. Attached is a laboratory for scientific medical research. The students are arranged in three classes: (1) graduates and undergraduates of the University of Bombay and other recognised Universities who are educated through the English language for medical degrees; (2) members of the European and domiciled European communities who are educated through the English language for the grade of military assistant surgeon; (3) undergraduates and others for the diplomas of the College of Physicians and Surgeons, Bombay.

University of Calcutta.[12]

For the degree of *M.B.* the preliminary scientific, first, and final M.B. examinations must be passed. The final is divided into two parts, major and minor, which may be taken together. The former includes medicine, surgery, and midwifery; the latter general pathology, medical jurisprudence, and hygiene. An examination for honours is held a week after the pass list is declared. The fees for the three examinations are Rs. 25, Rs. 30, and Rs. 50 respectively. The *M.D.* degree is granted after examination in medicine, pathology, and mental diseases not less than one year subsequent to the M.B. The fee is Rs. 100. Degrees of Master of Surgery (*M.S.*) and Obstetrics (*M.O.*) are also granted. A diploma in public health is granted to possessors of the M.B. degree or L.M.S. diploma by examination after a prescribed course of a year has been carried out. The fee is Rs. 100.

Ceylon Medical College.

The Ceylon Medical College[13] began in 1870, and the curriculum and examinations were revised in 1901 in conformity to modern requirements. In 1888 the licence in medicine and surgery (*L.M.S.*) granted by the College was recognised by the General Medical Council of the United Kingdom. Lady students were first admitted in 1892. There are two department in the College—viz., Medical and Apothecary. For admission to the Medical Department of the College candidates must pass Cambridge Senior Local or Senior School Certificate Examination or the London Matriculation Examination in the required subjects. The first professional examination is passed at the end of the first year, the second at the end of the third, the third at the end of the fourth, and the final at the end of the fifth. The fifth year's course includes, besides the usual final subjects, instruction in tropical medicine, skiagraphic demonstrations, and attendance at fever and leper hospitals. The total fees for the medical curriculum, including examination fees, amount to Rs. 1423.50. Various scholarships and medals are awarded by Government and private donors.

University of Hong-Kong.

The Faculty of Medicine of the University of Hong-Kong (1912) had its origin in the work of the Hong-Kong College of Medicine founded in 1887. The School of Anatomy was opened in 1913 and special schools for physiology, pathology, and tropical medicine were opened in 1918 and 1919. The University confers the degrees of *M.B.*, *B.S.*, *M.D.*, and *M.S.* The subjects of the first medical examination are physics, chemistry, and biology; of the second, Part I., anatomy, physiology, Part II., general pathology (including bacteriology), and elementary pharmacology; of the third, Part I., surgery and midwifery, Part II., medicine and pathology, including hygiene and tropical medicine. The fee for each part of each examination is $5, and for conferring the M.B., B.S. $25. The candidate for *M.D.* may present himself in two years and must take general medicine as well as one of the following: State medicine, pathology, midwifery, tropical medicine, physiology. The rules for *M.S.* are similar. The fee for each examination is $100 and for conferring the degree $100. The acting Registrar of the University is Mr. K. Brayshay, B.A.

University of Madras.

A medical school was established in Madras in 1835, which became the Madras Medical College in 1851 and was affiliated to the University in 1877. The College was originally for supplying assistant surgeons and hospital assistants to the army, but now undertakes also the training of students for the medical degrees and diplomas of Madras University. Candidates for the degrees of *M.B.*, *B.S.* must have passed the Intermediate Examination in Arts of the University or its equivalent, and have studied medicine for not less than five years in a college affiliated to the University. Four examinations are held, the third (at the end of the third year) comprising general pathology and hygiene, and the fourth the other professional subjects. The examination fees are Rs.25, Rs.25, Rs.40, and Rs.50 respectively. The *M.D.* degree may be taken not less than one year after a first-class pass in either medicine, midwifery, pathology, or tropical medicine. The conditions for the *M.S.* degree are similar. The examination fee in each case is Rs. 100. A degree in sanitary science (*B.S.Sc.*) can be taken in two parts one year after the M.B., B.S., the total fee being Rs.100.

The Madras Medical College includes a college department, an apothecary department, a chemists' and druggists' department, and a sanitary inspectors' department. The course of training for the M B., B.S. is charged Rs. 120 a year, or a lump sum of Rs.540 if paid in advance. Valuable scholarships are awarded by the Government and by the Dufferin Fund, and special Government stipends to women medical students.

Punjab University.

An examination for the degree of *M.B.*, *B.S.* is held annually in Lahore in May, and consists of three parts—first, second, and final. The first professional examination is open to candidates who not less than two years previously have passed the intermediate examination of the Science Faculty taking the medical student's group; it comprises anatomy, physiology, and materia medica, and the fee is Rs. 30. The second examination is in pathology, forensic medicine, and hygiene, and is taken at the end of the third year; the fee is Rs. 30. The final examination, for which the fee is Rs. 40, is taken at the end of the fifth year and comprises the rest of the professional subjects.

King Edward Medical College, Lahore, trains students for the medical degrees and diplomas of Punjab University. The college year consists of one long session of three terms. The course for the M.B., B.S. occupies five years, the fees being Rs.125, Rs.115, Rs.135, Rs.105, and Rs.105 in successive years. College scholarships are granted.

[11] The Registrar of the University is Mr. K. B. F. M. Dastur, M.A. The Bombay University Calendar (1920) vol. i. is a of book 662 pp., printed at the Government Central Press, Bombay.

[12] The University of Calcutta Regulations (1919) make a volume of 410 pp., published by the University. The Calendar is a volume of 814 pp., also published by the University.

[13] The Registrar of the college is Dr. P. J. Kelly. The Ceylon Medical College Calendar (1919–20) is a volume of 38 pp., published by authority and printed by H. R. Cottle, acting Government printer, Colombo.

REGISTRABLE FOREIGN MEDICAL DEGREES.

Certain medical diplomas granted in foreign countries also entitle to registration in the foreign list of the Medical Register, provided that the holder is not a British subject or that, being a British subject, the diploma was obtained under domiciliary conditions similar to those attached to colonial diplomas.

Summary of Registrable Degrees (the date in parentheses being the year in which Part II. of the Medical Act, 1886, was applied to the country in question).—*Italy* (1901): Degrees of Doctor of Medicine and Surgery of all the Royal Italian Universities. *Japan* (1905): Degrees of Bachelor of Medicine (Igakushi) and Doctor of Medicine (Igaku Hakushi) of the Imperial Universities of Japan; and the Degree of Bachelor of Medicine (Igakushi) of any Government or Prefectural special medical college, or of a private special medical college designated by a Minister of Education of the Empire of Japan. *Belgium* (1915): Degrees of Doctor of Medicine of the Belgian Universities of Brussels, Ghent, Liége, and Louvain, which give legal authority to practise medicine, surgery, and midwifery in Belgium.

Italy.

The regulation for the medical diploma is fixed by Royal Decree dated August 9th, 1910, and is the same for each of the 20 universities and institutes where courses of study are arranged. These are in alphabetical order: Bologna, Cagliari (Sardinia), Camerino, Catania, Ferrara, Florence, Genoa, Messina, Modena, Naples, Padua, Palermo, Parma, Pavia, Perugia, Pisa, Rome, Sassari,[14] Siena, and Turin.

The course covers six years, and embraces the following 20 constituent subjects: (1) experimental physics, (2) inorganic and organic chemistry, (3) botany, (4) zoology and comparative anatomy, (5) normal human anatomy (descriptive or systematic, macroscopic and microscopic), (6) physiology, (7) general pathology, (8) pharmacology and toxicology, (9) pathological anatomy and histology, (10) special medical (practical) pathology, (11) special surgical (practical) pathology, (12) medical clinics, general and special, (13) pediatric clinic, (14) surgical clinic, general, special and operative, (15) obstetric and gynæcological clinic, (16) ophthalmological clinic, (17) clinics of nervous and mental diseases, (18) hygiene and public health, (19) legal medicine, (20) dermatological and venereal clinic.

The distribution of these subjects over the six years varies somewhat at the different centres, but the official course at Siena may be taken as an example:—1st year: botany, zoology, normal human anatomy. 2nd year: normal human anatomy, general chemistry, experimental physics, embryology, experimental physiology. 3rd year: normal and topographical human anatomy, experimental physiology, bacteriology, general pathology. 4th year: materia medica, special medical and surgical pathology, pathological anatomy, medical and surgical clinic. 5th year: pathological anatomy, medical, surgical, ophthalmological, and dermatological clinic, hygiene and public health. 6th year: medical, surgical, nervous and mental, pediatrics, and obstetric clinic, legal medicine, operations, history of medical science. Twenty-six optional courses in special subjects can be attended by students of various years. The examinations are held in the latter half of October and June.

Japan.

The medical course is taken at the Imperial Universities of Kyoto and Tokyo, and at the medical schools of Formosa, Aichi, Chiba, Kanazawa, Kumamoto, Nagasaki, Okayama, and Sendai.

The *Kyoto College of Medicine*[15] was established in 1899. It includes institutes of anatomy, physiology, medical chemistry, pharmacology, pathology, hygiene, forensic medicine, medicine, surgery, ophthalmology, gynæcology, pediatrics, dermatology, oto-rhino-laryngology, orthopædic surgery, and psychiatry, each in charge of one or more of the 22 professors and 16 assistant professors, the director being Dr. Hayazo Ito. There is a four years' course of instruction, the first year being devoted to anatomy, histology, physiology, medical chemistry, and embryology. In the second year pharmacology, general pathology, pathological anatomy and histology, diagnosis, special medicine, general surgery, and bandaging are added. The first examination is held at the end of the second academic year, the second at the end of the fourth year in surgery, medicine, ophthalmology, gynæcology, and either hygiene or forensic medicine (the choice being determined by lot). At request students are also examined in pediatrics, dermatology, oto-rhino-laryngology, psychiatry, and orthopædic surgery. In the year 1919 79 students graduated in medicine from the College.

[14] Dean of the Medical Faculty, Professor Ottorino Rossi.

[15] The Kyoto Imperial University Calendar (1919-20) is a volume of 174 pp., published by the University.

Belgium.

The medical course for the degree of M.D. may be taken at any of the four Universities: Free University of Brussels, State University of Ghent, University of Liége, Catholic University of Louvain. After a preliminary year and an examination which may be taken in two parts—(1) logic, zoology, botany; (2) physics, chemistry, geology—the student becomes "candidat en sciences naturelles." Two years are then devoted to the ancillary sciences, the examination again being in two parts—(1) embryology, systematic anatomy Part I., histology, comparative anatomy, physiology; (2) systematic anatomy Part II., regional anatomy, special histology, psychology, special physiology—when the stage of "candidat en médecine" is reached. Professional studies occupy three years at least, and there are three further examinations. The first includes (i.) general pathology and therapeutics; (ii.) elements of pharmacology and pharmacodynamics; (iii.) pathological anatomy; (iv.) general surgical pathology. The second includes: (i.) medical pathology and special therapeutics, including mental diseases; (ii.) special surgical pathology; (iii.) public and private hygiene; (iv.) the theory of accouchement. The third and final comprises (i.) legal medicine, (ii.) medical clinic, (iii.) surgical clinic, (iv.) operations, (v.) ophthalmological clinic, (vi.) obstetric clinic, as well as practical tests in pathological microscopy and regional anatomy.

The Universities of Ghent and Liége grant a diploma of "médecin-hygiéniste" after examination to medical graduates of at least one year's standing.

University of Liége.—The Faculty of Medicine includes 15 professors and eight lecturers. The dean is Professor L. Fredericq (Institut physiologique). The fee for inscription in the medical faculty is Fr. 200 for the grade of candidate and Fr. 200 for each of the three parts of the professional examination. The Dean of the Medical Faculty is Dr. F. Fraipont. Details of the courses may obtained from Professor Ch. Julin, secretary to the medical faculty.

University of Louvain.—All the courses in the Faculty of Medicine have been resumed. For the third professional examination the programme is as follows: A. Lemaire (medical clinic), R. Schoekaert (theory of accouchement), A. Vander Straeten (ophthalmological clinic), R. Bruynoghe (legal medicine), G. Debaisieux (surgical clinic). L. Van den Wildenberg (oto-rhino-laryngological clinic), A. Van Mosuenck (dental clinic), O. De Mees (minor surgery). The dean of the faculty is Professor Schoekaert, and the secretary Professor Bruynoghe (rue Marie Thérèse 100).

University of Brussels.—The former courses in the Faculty of Medicine were resumed in January, 1919, as well as the clinics at St. Jean and St. Pierre, and the instruction for the diploma of public health.

Details of these courses may be obtained from the secretary of the University at rue des Sols 14, Brussels.

HEALTH OF BLACKPOOL.—The annual report for the year 1919 by Dr. E. W. Rees-Jones, medical officer of health for Blackpool, contains interesting observations on social conditions in that town. The infantile mortality rate decreased from 110·5 in 1918 to 96·8 in 1919, while the high general death-rate of 15·5 was considered as still due to the aftermath of war. On the housing question Dr. Rees-Jones says:—

"Basement dwellings constitute one of the most unsatisfactory features in Blackpool, and it is highly desirable that the corporation should have legal powers to prohibit, except by special registration, the use of basements as separate tenements. While some of the front basements in houses facing south might be considered suitable for the purpose, the back basements are very unsuitable, being badly lighted and ventilated. Constant supervision also is necessary to prevent overcrowding and other insanitary conditions arising from the action of the tenants, and 316 visits were paid by the sanitary inspectors."

Dr. Rees-Jones comments on the disadvantages of the production and distribution of milk by private enterprise, and looks forward to the time when the municipality will organise and control the milk-supply.

Correspondence.

"Audi alteram partem."

THE RETURN OF THE DISABLED SOLDIER TO CIVIL LIFE.

To the Editor of THE LANCET.

SIR,—The national scheme for the employment of disabled ex-Service men set out to "secure and maintain the complete absorption of all disabled men into industry." Its achievements have been remarkable, but it is now apparent, after some 18 months, that there remains in the country a residue of disabled men who are unemployable in ordinary industry, "a residue for whom no provision at present exists—namely, those who possess some potential capacity, but could only exercise it if some special arrangements were made for enabling them to do so." (See White Paper 185, p. 9, "Employment.")

Some recent figures, or lack of figures, may throw light upon the extent of the problem of war disablement which has still to be faced.

(1) Wholly disabled, at their homes or in institutions	?
(2) The tuberculous, the epileptic, and blind	?
(3) Still in hospitals	say 60,000
(4) Disabled men still under concurrent treatment and training, shortly to be increased to 4400 (Minister of Pensions, *Times*, August 16th)	2,200
(5) Disabled under training by the Ministry of Labour (Minister of Labour, *Times*, August 12th)...	24,000
(6) Disabled awaiting such training (ibid.)...	21,700
(7) Disabled officers, &c., under training (White Paper, p. 1)	5,000
(8) Disabled, registered as requiring employment (Minister of Labour, House of Commons, July 22nd)	22,000
(9) Disabled already absorbed into industry—	
Officers, &c. (White Paper, p. 1)	9,301
Men (Minister of Labour, *Times*, August 12th) ...	176,000

What is this "residue" referred to in the White Paper? It is made up of a considerable proportion of "seriously injured" who are now registered for employment, together with a large number of men who are from various reasons not so registered. The residue is being continually reinforced from Classes 3, 4, 5, 7, and 9. There must always be a proportion from the large numbers of men who are being absorbed into industry, who break down and return under medical care, and although the disabled men training under the Ministry of Labour (5) are supposed to be fit to work alongside of normal men, experience shows that here, too, a certain proportion break down.

The approximate numbers of the subnormal may be computed from the figures already given and from my own experience of different categories of disablement at the Enham Village Centre. The men at Enham were no doubt rather more disabled than those usually sent to convalescent centres. A few had lost a limb, more were partly paralysed by injuries to limbs. Many others were permanently affected by injuries to the head, either definite wounds or shock, resulting in many forms of disturbance—mental irritability, depression and anxiety, fits and crises of various kinds. Others had been gassed, and remained, at all events for some time, unfit for ordinary work. Others were hampered by heart affections and rheumatism and chronic infections, like malaria and dysentery.

Excluding all who were likely to pass out and take up ordinary employment with a fair hope of success, as well as a small number of men incapable of useful work, I found a remainder, amounting to nearly 20 per cent., whom we placed in a special category as "subnormal." Taking the country as a whole, one subnormal in ten disabled would be a safe minimum estimate. It may well be considerably more. On this basis there cannot be less than 25,000 ex-Service men in the country who are at present unfit for ordinary conditions of industry, but who yet possess a good capacity for work. What is to be their future? Many whom I have seen have shown their keenness by trying work again and again, and have broken down.[1] At present these weakened workers, often of fine character and capacity, have no prospect of employment under the only conditions that are possible for them. The apprehension, depression, and bitterness of mind resulting from such a position can be readily imagined. When they leave the treatment and training centre, or break down after taking employment, they are the despair of the local committees and of the people who are trying to set them on their feet. We must except the fine work being done by the Lord Roberts workshops, where a limited number of men, chiefly injured in the right arm, and therefore unable to compete in the open market, are given permanent paid employment, according to their ability. But these workshops are unfortunately inadequate to deal even with their own class of cases. Following Earl Haig's recent appeal, a certain number of the men we have in mind will probably be given employment by charitable persons, but if experience be any guide it is not likely to be permanent. If to the above 25,000 be added the tuberculous and the epileptic, who are in the same unprovided condition, the total of the subnormal is indeed a disquieting one.

Two recommendations are made by the Parliamentary Committee in the White Paper:—

(1) "That special attention be given to the cases of men who, though not requiring treatment, and therefore not eligible for the convalescent centres, need some form of training or employment in special workshops, or under special conditions, in order to exercise their earning capacity, and that such arrangements be made for them as may be found to be necessary."

(2) "That special attention be given to the desirability of establishing disabled men who have received agricultural training on cottage holdings."

But surely the injured worker must de facto remain an object of medical care, especially in the early stages of employment, and this often means "treatment," mental or physical. He cannot continue in the convalescent centre after his "training" is completed, nor is it advisable that he should do so. His one desire is to be settled, and if married to have his family about him. Treatment must therefore follow him into his new life. As regards (2), it may be of interest to note that in France the existence of this class of subnormal men is a less difficult problem, owing in great measure to the system of land tenure. Investigation shows that the great majority of such men appear to have returned home and to be working on their own small piece of land. They are, as in England, unfit to do a full day's work, either in industry or on the land, but they are perfectly capable of doing their two, three, or four hours a day on their land, thus eking out a slender living with the help of their pensions and their friends. Their health and earning capacity are meanwhile improving under conditions of quiet and freedom from care. The great proportion of these subnormal men in France, as in England, are nerve-strained, and for them such conditions are essential.

What proportion of subnormal men in our country are likely to find their vocation on the land? I should say not more than 1 in 4. The majority either have not the necessary physical strength or the inclination for agriculture or horticulture. Many have their occupations—as printer, colour-etcher, photographer, book-binder, furniture-maker, shoemaker, tailor—and they have no desire to give them up. What they want is the opportunity to carry them on under proper conditions in the country. A man can work at his trade two or three or six hours daily instead of eight, but only in a quiet atmosphere. Given these conditions, his skill is as good as ever. In his spare time we shall find him in his garden or allotment.

Special conditions of life and supervision are obviously needful, not only for the men just described, but for the seriously injured now under training, as well as for the many who are falling out of the ranks of industry. A very clear distinction ought to be drawn between the *temporary* care of disabled men away from their homes in treatment and training centres, and the *permanent* care of the residue of subnormal men with their families

[1] Mr. H. L. Rothband (*Times*, August 21st) quotes the testimony of many large employers that disabled employees are usually anxious for work and are "keener and more conscientious" than the others.

in communities. The first task has been taken over by the Government. The second has yet to be accomplished. Is not this the time for private organisations and friends of the disabled all over the country to coöperate with the Government in organising and administering assisted industries for these weaker brethren? It cannot be done by machinery alone. Much individual care, skilled supervision, and above all the right atmosphere are necessary to give these men a chance, as well as the new special study of the adjustment of vocation to mental and physical capacity. I have seen the power of work return in apparently hopeless cases under the right handling. Many men labelled "subnormal" regain their full earning capacity. Many others will always need the sheltered life.

My experience at Enham has convinced me that all types of partial disablement ought to be mingled together in these village communities, because the interaction of different points of view is favourable to health and morale. And I earnestly hope that the medical service in these communities will include both mental and physical methods of treatment. To the medical profession at this juncture belongs the task of formulating what is needful for this large remnant of weakened and dispirited men, and putting before the public and the Government a remedy for a distressing state of affairs.—I am, Sir, yours faithfully,

London, August 29th, 1920. R. FORTESCUE FOX.

THE TIME OF DAY TO GIVE ANTIMONY TARTRATE FOR BILHARZIA.

To the Editor of THE LANCET.

SIR,—In THE LANCET of August 21st (p. 392) Dr. F. G. Cawston, writing of intravenous injections of antimony tartrate, states:—

"Toxic effects are undoubtedly lessened where the injections are given shortly after a light breakfast, instead of later on in the day. This point has been emphasised by Dr. J. B. Christopherson."

In my article in the *Journal of Tropical Medicine and Hygiene* for July 15th, 1919, I did not exactly say this. I related there that one of the most intelligent of my patients, when injected early in the morning, 9.30 or 10 A.M., found the after-effects to be nil, whereas when the injections were given near lunch time, 12.30 or 1 P.M., he always had giddiness, vomiting, and the reaction generally was severe. "It would therefore appear," I said, "that injections should be given some considerable time, three or four hours, before meal-time." I was referring to natives in the hospital at Khartoum, who breakfast soon after 7 A.M. and lunch at 12–1 P.M.

The question of the best time for making the injections, from the point of view of the condition of the stomach and the digestive processes, is in my opinion a very important one. They should not be given when the stomach is full—for instance, just after a heavy meal—when the blood is largely engaged in the portal circulation with the process of digesting the meal, for, if given then, the toxic, depressing action of the drug will be emphasised, the pulse will possibly be slowed and become weaker, the face pinched and perhaps dusky, the pupils contracted. On the other hand, if given just before a meal, when the patient is depressed and perhaps faint for want of food, the toxic effects of the drug will also be emphasised, especially if a meal be taken directly after. This is shown by a feeling of giddiness, retching, perhaps vomiting, reaction generally. It seems only a matter of common sense that the drug, which has a tendency to depress, should not be given at the time when the patient naturally is depressed. The time of day in itself is not important.

But it is of practical importance, especially when dealing with out-patients, who are not under the same control as in-patients are, to tell them they must not engage in exhausting work previous to nor hurry to be in time for the injection, so that they either have no time for a meal or only time for a hurried scramble of bread and cheese and a glass or two of beer immediately before arrival. Therefore my advice to out-patients is to have a quiet morning. A little necessary work will not matter, but a light digestible meal must be arranged two and a half or three hours before the injection is due. As a light meal I should, for example, advise a basin of good soup with toast or bread, a little fish, and a milk pudding. For a patient in Egypt, the Sudan, or South Africa some corresponding and appropriate food should be taken two and a half or three hours previous to the injection.

It is by attention to details such as these that success is to be attained.—I am, Sir, yours faithfully,

August 24th, 1920. J. B. CHRISTOPHERSON.

GENERALISED HERPES OR CHICKEN-POX?

To the Editor of THE LANCET.

SIR,—The recent discussion in THE LANCET upon herpes and chicken-pox suggested that a case at present under my care may be of general interest.

My patient, a man 80 years old, spent four hours in the open air watching a cricket-match on June 26th. The next day he was suddenly seized with an acute pain over the outer side of the left leg, with definite tenderness along the course of the external popliteal nerve. I treated him for neuritis, but on June 28th his pain was only slightly less severe. On June 29th I noticed several small papules evenly distributed over the trunk, extending to the shoulders, arms, and back of both thighs. There was no rash on the face, forearms, or legs. The next day the rash had mostly become vesicular, but new papules had appeared with the same distribution with the addition of some over both legs. Over the outer side of the left leg there was also a fairly well marked erythema, which I then attributed to the effect of the liniment. Apart from this erythema, the appearance was indistinguishable from that of chicken-pox of moderate severity. On July 1st an intense herpetic eruption appeared on the left buttock and leg in two well-marked lines, corresponding probably to the cutaneous sacral nerves, and over the sole of the left foot in a single well-marked line corresponding to a possible cutaneous branch of the internal plantar nerve. The whole of the left leg was now painful, but the acute pain at the orginal site had diminished.

There was no doubt that the patient was now suffering from an attack of herpes zoster, and I recalled a paper by Dr. Cranston Low[1] on the possible association of varicella and herpes zoster. Six weeks after onset the patient still bears pitted marks, still complains of occasional shooting pains and hyperalgesia over the region of distribution. I must mention that previous to the onset of this illness, and commencing on June 14th last, the patient took in all half a drachm of liq. arsenicalis in m 2 doses three times daily after food as a general tonic. I cannot obtain any history of a previous attack of chicken-pox or shingles.

At present the question in my mind is whether this case has been one of varicella associated with herpes or one of "herpes zoster generalisatus," as described by Dr. Low.—I am, Sir, yours faithfully,

STEWART MCNAUGHTON, M.D. Edin.,
D.P.H. Camb., &c.,
Honorary Physician, Monkwearmouth Hospital.

Sunderland, August 17th, 1920.

The Services.

ROYAL NAVAL MEDICAL SERVICE.

THE following appointments have been made:—Surgeon Commanders: R. L. Jones to *Chatham*; P. H. Boyden to *President*, additional, for Porton Experimental Station; J. R. Muir to R.N. Hospital, Haslar; and R. H. McGiffin to *Raleigh*. Surg. Lieut.-Cmdr. W. H. Murray to R.N. Hospital, Gibraltar. Surg. Lieut. W. J. Colborne to 3rd R. M. Batt., Eastern Mediterranean.

Surg. Cmdr. H. W. Finlayson is placed on the Retired List and granted the rank of Surgeon Captain.

ARMY MEDICAL SERVICE.

Major W. Davis relinquishes acting rank of Lieutenant-Colonel.

Temp. Capt. D. C. McCabe-Dallas relinquishes acting rank of Major.

Capt. J. M. Macfie to be acting Major.

Temp. Major G. S. Simpson (Captain, R.A.M.C., T.F.) relinquishes his temporary commission on re-posting.

Capt. F. Holmes, from Spec. Res., to be Lieutenant and to be temporary Captain.

Temp. Major A. L. B. Green (Major, 1st Hereford R., T.F.) relinquishes his temporary commission.

Capt. H. J. Bensted to be temp. Major whilst specially employed.

The undermentioned to be temporary Captains: D. E. Hearn (late Captain, R.A.M.C., Spec. Res.), J. D. Judson (late temporary Captain), and H. H. McClelland (late temporary Captain).

Major-Gen. Sir H. N. Thompson, half-pay list, retires on retired pay.

[1] Brit. Med. Jour., Jan. 25th, 1919.

Temp. Lieut.-Col. T. S. Good relinquishes his commission on ceasing to be employed at the Ashurst War Hospital, and retains the rank of Lieutenant-Colonel.

ROYAL ARMY MEDICAL CORPS.

Lieut.-Col. H. W. K. Read, and Majors E. G. Ffrench (granted the rank of Lieutenant-Colonel), T. F. Ritchie retire on retired pay.

Temp. Capts. S. H. Pitcairn and J. L. Wilson relinquish the acting rank of Major.

Capt. D. Fettes (late temporary Captain, R.A.M.C.) and Temp. Capts. J. McP. MacKinnon and H. S. Moore to be Captains.

Temp. Capt. M. F. D. Graham to be Lieutenant and to be temporary Captain.

Lieut. A. M. Simson, from T. F. Res. (Art.), to be Lieutenant.

Officers relinquishing their commissions:—Temp. Capts. R. J. Monahan, M. J. Wilson, C. A. B. Horsford, E. C. Arnold, H. H. Perry, H. C. Sutton, W. L. G. Anderson, J. M. MacPhall, P. Johnson retain the rank of Captain.

SPECIAL RESERVE OF OFFICERS.

Officers relinquishing their commissions: Major H. G. Smeeth. Capt. R. E. Grandy, Capt. G. A. MacDonald (retains the rank of Captain). Capts. (granted the rank of Major) W. F. Wood, R. P. Starkie, S. J. V. Furlong, R. Taylor. Capts. (retaining the rank of Captain) A. B. Dummere, W. R. McLinden, R. R. Traill, M. Morrison, D. C. Rennie, W. McWilliam, H. L. Addison, H. J. Duske, T. L. Crawhall, A. Dick, T. B. Moyes, F. J. Harvey, S. Adler, C. Young, Capt. A. A. Atkinson, F. Bignold, F. Randall, I. Evans. Lieut. A. Kennedy (retains the rank of Lieutenant).

Capt. A. Bulleid relinquishes the acting rank of Major.

GENERAL RESERVE OF OFFICERS.

Capt. H. J. Bower resigns his commission and retains the rank of Captain.

TERRITORIAL FORCE.

Capt. E. Scott (late temporary Captain, R.A.M.C.) to be Captain.

Capts. (acting Majors) M. Brennan, W. A. Brechin, and A. Cameron relinquish their acting rank on ceasing to be specially employed.

Officers relinquishing their commissions:—Major E. Turton and Capts. J. H. Peyton and C. S. Young are granted the rank of Lieutenant-Colonel.

Capts. J. Arthur, A. Oliver, W. Scott, D. M. Spring, T. W. Hancock, C. H. Bullen, and G. M. McGilivray are granted the rank of Major.

Capt. F. A. Pring resigns his commission.

Captains retaining the rank of Captain: J. E. Ransford, F. Ryan, S. Simpson, J. Fenton, H. W. Kerrigan.

Col. W. Ranson vacates the appointment of Assistant Director of Medical Services, East Lancs. Division.

Lieut.-Col. (Bt. Col.) F. H. Westmacott, from 2nd Western General Hospital, to be Colonel and Assistant Director of Medical Services, East Lancs. Division.

Capt. A. G. Wilson, from 3rd Northern General Hospital, to be Captain.

Capt. G. Eager (late temporary Captain, R.A.M.C.) to be Lieutenant, and to relinquish the rank of Captain.

Capt. J. G. Morrin (late temporary Captain, R.A.M.C.) to be Captain.

4th London General Hospital: Capt. A. J. Jex-Blake resigns his commission and is granted the rank of Major.

4th Northern General Hospital: Major W. E. F. Tinley resigns his commission and retains the rank of Major.

2nd Western General Hospital: Capt. J. Wharton resigns his commission and retains the rank of Captain.

2nd Eastern General Hospital: Capt. H. H. E. Scatliff resigns his commission and retains the rank of Captain, with permission to wear the prescribed uniform.

3rd Southern General Hospital: Capt. F. Clarke is restored to the establishment.

TERRITORIAL FORCE RESERVE.

Capt. H. G. L. Haynes to be Lieutenant-Colonel.

Major A. E. Hodder resigns his commission, and is granted the rank of Lieutenant-Colonel.

ROYAL AIR FORCE.

Medical Branch.—The undermentioned are transferred to unemployed list: Capts. W. G. Weston, J. D. Cherry, M. C. Breese, D. Cromie, Lieut. A. Wilson.

INDIAN MEDICAL SERVICE.

The King has approved the retirement of Lieut.-Col. W. H. E. Woodwright.

DECORATIONS.

Mr. E. S. Crispin, Director of the Soudan Medical Department and a Member of the Governor-General's Council, and Dr. A. F. Macallan, of the Ophthalmic Hospital, Egyptian Department of Public Health, have been appointed Commanders, and Dr. J. A. Clark, of the Medical Service of the Egyptian Army, has been appointed a Member of the Civil Division of the Most Excellent Order of the British Empire for services rendered in Egypt and the Soudan.

American.

Distinguished Service Medal.—Maj.-Gen. Sir W. B. Leishman, K.C.M.G., C.B., F.R.S., K.H.P.

Belgian.

Croix Civique.—1st Class: Lt.-Col. S. de C. O'Grady, C.M.G., D.S.O., R.A.M.C.

French.

Médaille de l'Assistance Publique.—"*En Argent*": Temp. Capt. H. O. Gough, R.A.M.C.; Lt.-Col. H. MacCormac, C.B.E., late R.A.M.C. "*En Bronze*": Temp. Capt. H. M. Agnew, R.A.M.C.; Temp. Capt. M. Eager, R.A.M.C.; Temp. Maj. T. N. Frood, R.A.M.C.; Temp. Capt. F. A. Ross, R.A.M.C.

Roumanian.

Order of the Crown of Roumania.—"*Chevalier*": Temp. Capt. M. Eager, R.A.M.C.

Medical News.

UNIVERSITY OF CAMBRIDGE.—The following have been reappointed Demonstrators: Biology, Mr. H. H. Brindley, St. John's; Animal Morphology, Mr. J. T. Saunders, Christ's; Comparative Anatomy, Mr. J. Gray, King's.

SOCIETY OF APOTHECARIES OF LONDON.—At examinations held recently the following candidates passed in the subjects indicated:—

Surgery.—L. Burvill-Holmes (Sects. I. and II.), Guy's Hosp.; M. C. Hartley (Sects. I. and II.), London Hosp.; H. Morris (Sect. I.), St. Bart.'s Hosp.; J. W. E. Ord (Sects. I. and II.), McGill; A. C. D. Telfer (Sects. I. and II.), St. Bart.'s Hosp.; and C. M. Tinkler (Sects. I. and II.), Liverpool.

Medicine.—J. A. Cohen (Sects. I. and II.), King's Coll. Hosp.; M. C. Hartley (Sects. I. and II.), London Hosp.; R. E. Jenkins (Sects. I. and II.), Charing Cross Hosp.; W. A. O'Connor (Sect. II.), Oxford and Birmingham; J. W. E. Ord (Sects. I. and II.), McGill; A. C. D. Telfer (Sects. I. and II.), St. Bart.'s Hosp.; and C. M. Tinkler (Sects. I. and II.), Liverpool.

Forensic Medicine.—B. C. Betts, Manchester; A. Y. Cantin, London Hosp.; J. L. Delicati, Bristol; M. C. Hartley, London Hosp.; W. A. O'Connor, Oxford and Birmingham; J. W. E. Ord, McGill; A. C. D. Telfer, St. Bart.'s Hosp.; C. M. Tinkler, Liverpool; and J. Solomonoff, London Hosp.

Midwifery.—A. Y. Cantin, London Hosp.; W. H. Cellier, Guy's Hosp.; R. Erskine Gray, Charing Cross Hosp.; C. T. Gasking, Liverpool and Sheffield; M. C. Hartley, London Hosp.; W. A. O'Connor, Oxford and Birmingham; J. W. E. Ord, McGill; J. Sullaiman, Guy's Hosp.; A. C. D. Telfer, St. Bart.'s Hosp.; and E. W. Terry, Manchester.

The Diploma of the Society was granted to the following candidates, entitling them to practise medicine, surgery, and midwifery: L. Burvill-Holmes, A. Y. Cantin, M. C. Hartley, R. E. Jenkins, J. W. E. Ord, W. A. O'Connor, and A. C. D. Telfer.

Lord Southborough has been appointed chairman of the War Office Departmental Committee to inquire into the relation between shell shock and the death sentences for alleged cowardice in the earlier part of the war with a view to guidance in the future (see THE LANCET, May 8th, p. 1033, Parliamentary Intelligence).

RADCLIFFE INFIRMARY, OXFORD.—A post-graduate course will be held from Oct. 1st to 9th, which will include demonstrations of operations, medical cases, and cases in special departments in the mornings, whereas in the afternoon papers will be read by specialists of distinction, among whom will be the Regius professor, Sir Archibald Garrod, and Professor G. Dreyer. A dinner will be held in Queen's College Hall on Tuesday, Oct. 5th, at 7.30 P.M. (morning dress). The price of tickets is 15*s.*, including wines, and they will be issued to those applying not later than Oct. 1st to Dr. Hugh Whitelocke, secretary to the committee, Radcliffe Infirmary, Oxford.

UNIVERSITY OF SHEFFIELD.—The University has recently founded a whole-time chair of pharmacology to which Dr. Edward Mellanby, at present professor of physiology in the University of London, has been appointed. Professor Mellanby has also been elected honorary physician to the Royal Infirmary in the place of Dr. W. S. Porter, who has resigned after 30 years' service. This direct connexion between the experimental study of pharmacology in the University and its clinical application to the treatment and investigation of disease offers a fruitful field for progress in this branch of medicine, and should lead to important results. Another interesting step is the appointment of Dr. J. B. Leathes, F.R.S., professor of physiology in the University, as honorary physiologist to the Royal Infirmary and the Royal Hospital. By arrangement between the University and the clinical institutions Professor Leathes and his assistants will have charge of clinical laboratories there, and will be responsible for all the chemico-physiological work required by the clinicians. From the point of view of clinical medicine this arrangement should prove of the highest value, and on the student's side it is a first step in the scheme evolved by the Faculty of Medicine to bridge over the gap between the early laboratory years and the later clinical stages of the student's curriculum. In outline this scheme consists (1) in holding the Second M.B. at the end of the second year in general anatomy and physiology; (2) in beginning clinical work in the third year, and continuing applied anatomy and physiology during the third and fourth years as subjects upon which, together with pathology and pharmacology, the student will be examined in the Third M.B. at the end of the fourth winter. Students will thus, during the middle third of their career, be doing clinical hospital practice and laboratory work in applied subjects simultaneously. It is hoped by this means to impress upon them that there are such sciences as anatomy and physiology of the living, upon which ultimately depend medicine, surgery, and pathology

JOINT HOSPITAL ADVISORY COUNCIL IN SHEFFIELD.—About a year ago the governing bodies of the four voluntary hospitals in Sheffield agreed to the formation of a Joint Consultative and Advisory Council, consisting of representatives of the boards and staffs of the Royal Infirmary, the Royal Hospital, the Jessop Hospital for Women, and the Hospital for Sick Children, together with representatives of the University, the Edgar Allen Institute for Medico-mechanical Treatment, and of the trades organisations of the city. The Lord Mayor is ex-officio President, and the Vice-Chancellor of the University (Sir Henry Hadow) was appointed chairman. The functions of the Council are, as indicated by its title, of a consultative and advisory character only, and although it has no direct control over any of its constituent bodies, it has already proved its value in bringing together all these hitherto distinct institutions, and enabling joint action to be taken in various matters of hospital policy submitted for its consideration. Many important questions have been investigated, and the Council is likely to prove of increasing utility in dealing with the difficulties with which all voluntary hospitals are faced. In Sheffield, as elsewhere, the immediate need of the voluntary hospitals is for increased funds to meet current expenses, and this subject is having the careful consideration of the Council.

THE Ministry of Agriculture is arranging to employ obsolete battleships as floating laboratories for the investigation of foot-and-mouth disease.

POST-GRADUATE LECTURES FOR PANEL DOCTORS.—The following post-graduate lectures will be held this autumn under the auspices of the London Panel Committee: A course on Laboratory Methods in the Prevention, Diagnosis, and Treatment of Disease will be given by Dr. W. W. C. Topley at Charing Cross Hospital on Thursdays at 4 P.M. (date to be announced later); and a course on Venereal Diseases, by Colonel L. W. Harrison, will be held at St. Thomas's Hospital commencing Thursday, Sept. 23rd, at 4 P.M. The fee for each course will be £3 3s., payable to the secretary of the Panel Committee at Staple House, 51, Chancery-lane, London, W.C. 2, who will forward cards of admission.

ANNUAL DINNERS OF THE MEDICAL SCHOOLS.—For the convenience of past students of those of the London medical schools which are holding annual dinners in early October we append the following details as far as we have hitherto received them:—

St. Bartholomew's Hospital old students' annual dinner will be held on Friday, Oct. 1st, at 6.30 P.M. for 7 P.M. in the Great Hall of the Hospital. Sir Anthony Bowlby will preside. The honorary secretary is Sir C. Gordon Watson, 82, Harley-street, London, W. 1.

Charing Cross Hospital Medical School annual dinner of past and present students will be held on Monday, Oct. 4th at 7 for 7.30 P.M., at the Adelaide Gallery, Gatti's Restaurant. Dr. J. Mitchell Bruce will take the chair. Past students requiring tickets are requested to write to the dean of the school.

St. George's Hospital Medical School annual dinner is to be held at Prince's Restaurant, Piccadilly, at 6.30 for 7, on Friday, Oct. 1st. Sir Humphry Rolleston will preside, and the honorary secretaries are Mr. Ivor Back and Dr. Claude Frankau.

King's College Hospital past and present students' dinner will be held on Friday, Oct. 1st, at 7 for 7.30 P.M., at the Criterion Restaurant, Piccadilly-circus, W. Dr. Philip Boobbyer will preside. Applications for tickets (price 15s., exclusive of wine) should be sent to the honorary secretaries, King's College Hospital.

St. Mary's Hospital annual dinner of past and present students will be held on Friday, Oct. 1st, at the Connaught Rooms, Great Queen-street, London, W.C., at 7 for 7.30 P.M. Sir John Goodwin will preside. Tickets (price 12s. 6d., exclusive of wine) can be obtained from the honorary secretary, Mr. V. Warren Low, 76, Harley-street, London, W. 1.

Middlesex Hospital Medical School annual dinner will be held on Friday, Oct. 1st, at 7.30 P.M., at the Wharncliffe Rooms, Great Central Hotel, Dr. R. A. Young in the chair. Those wishing to be present should communicate as soon as possible with the secretary-superintendent of the hospital.

Westminster Hospital old students' dinner will be held on Thursday, Sept. 30th, at the Imperial Restaurant, Regent-street, at 7.30 P.M. Lord Glenconner will be in the chair and the honorary secretary is Dr. Adolphe Abrahams.

University College Hospital Medical School annual dinner of old students will be held at the Imperial Restaurant, Regent-street, on Friday, Oct. 1st, at 7 for 7.30 P.M. Professor Harry Littlewood will preside. Tickets, price 15s. (not including wine), may be obtained from the honorary secretaries, Dr. A. M. H. Gray and Mr. Gwynne Williams, 30, New Cavendish-street, London, W. 1.

MANCHESTER ROYAL INFIRMARY: OLD RESIDENTS' DINNER.—A notice of this dinner, which will take place on Oct. 9th, has been sent out to all members of the Old Residents' Club. Any members who have failed to receive one are asked to communicate with the honorary secretaries at the Royal Infirmary, Manchester.

HOSPITAL CONDITIONS IN MANCHESTER.—It is calculated that the expenditure on Manchester hospitals last year exceeded the income by about £30,000. The Manchester Royal Infirmary had a deficit of over £17,000, which, however, was considerably lessened by an opportune donation. The Ancoats Hospital had an overdraft of £9000, and the St. Mary's Hospitals for Women and Children a deficit on the year's working of nearly £7000. The Salford Royal Hospital is also spending £7000 more than its annual income.

INSTRUCTION IN HOSPITAL ADMINISTRATION.—A three months' course of lectures and demonstrations in hospital administration will be given at the Western Hospital, Seagrave-road, Fulham, S.W., by Dr. R. M. Bruce, on Tuesdays and Fridays, at 5 P.M., beginning Tuesday, Sept. 28th. Medical men desiring to attend should pay the fee for the course (£3 3s.) to the Clerk to the Metropolitan Asylums Board, Embankment, E.C., giving their full name and address, before the course begins.

A REPORT issued this week by the Commissioner of the Metropolitan Police shows that 688 persons were killed in street accidents in the metropolitan area during the year 1919, an increase of 76 over the fatal accidents of 1918. Of the total, private motor-cars accounted for 138 and motor-buses for 136. Tramcars, cabs, and motor-cycles were far behind with 42, 26, and 25 fatalities respectively.

SOCIETY FOR THE STUDY OF INEBRIETY.—A meeting of this society will be held in the rooms of the Medical Society of London, 11, Chandos-street, Cavendish-street, W., on Tuesday, Oct. 12th, at 4 P.M., when, after consideration of the revised rules and by-laws submitted by the Council, Dr. James A. Davidson will open a discussion on "Special Clinics for Inebriates." Each member and associate is at liberty to introduce visitors. Subscriptions for the session and donations should be forwarded to the honorary treasurer, Mr. Arthur Evans, at 28, Devonshire-place, London, W. 1.

THE DANGEROUS DRUGS ACT.—It is announced that from Sept. 1st the import and export of opium, medicinal opium, morphia, diamorphine (heroin), cocaine, and ecgonine are prohibited except under licence of the Secretary of State. Applications for licences to import any of these drugs should be addressed to the Under Secretary of State, Home Office, Whitehall, London, S.W. 1, while applications for export licences should be addressed to the Board of Trade (Imports and Exports Department), Great George-street, London, S.W. 1. The import and export of raw opium will only be allowed through the ports of London and Liverpool, and all packages for export which contain raw opium must be marked in a certain manner. The import, export, manufacture, sale, or possession of opium prepared for smoking is absolutely prohibited. Regulations for controlling the manufacture, sale, possession, and distribution in the United Kingdom of the above-mentioned drugs are being prepared and will be issued shortly. Pending the issue of these regulations the restrictions on dealings in opium and cocaine and on the manufacture of cocaine imposed by Defence of the Realm Regulation 40b will continue in force.

THE Joint Committee of the British Red Cross and St. John of Jerusalem have issued a leaflet setting out the needs and aims of the joint societies. They hope to collect £1,000,000 a year for the continued care of sick and wounded soldiers; for maternity, infant, and child welfare work; for the erection and maintenance of sanatoriums; the extension of the motor ambulance service and the peace library; materials for work parties for hospitals and welfare centres; and other benevolent purposes. "Our Day" is fixed for Thursday, Oct. 14th, when a special effort will be made to raise funds in commemoration of the amalgamation of the British Red Cross Society and the Order of St. John. During October and November effort will be made to collect funds for helping ex-soldiers and sailors still in need of treatment, for assisting the home civil hospitals and curative institutions, and for extension of the home ambulance service and peace library. It is hoped that the collections on one Sunday—Nov. 14th is suggested—throughout the kingdom will be donated to the joint societies, and an appeal to this effect has been signed by the Archbishops of Canterbury and York, Cardinal Bourne, and the heads of all the Free Churches. The amount from these Sunday collections will be shared with the Imperial War Relief Fund, which is dealing with the typhus scourge of Central Europe.

THE late Dr. David James Williams, of Llanelly, left £250 to the Llanelly Hospital for the better equipment of the operating theatre.

THE freehold of the Throat Hospital in Golden-square is being offered for sale with a view to the rebuilding of the hospital on a less costly site.

Dr. E. Roux, president of the Superior Council of Hygiene and director of the Pasteur Institute, has been awarded the Grand Cross of the Legion of Honour.

Mr. Robert Dunstan, M.R.C.S., L.R.C.P., barrister-at-law, has been appointed deputy coroner for the North-Eastern District of the County of London.

Dr. A. D. Cowburn, acting deputy coroner for North-East London, has been appointed deputy coroner for the South-Western district of London and the City of Westminster.

ON relinquishing his practice at Northwood on account of health, Dr. R. E. Humphry was the recipient of a presentation from his old patients. Dr. Humphry was surgeon in charge of No. 67 General Hospital at Salonika.

LITERARY INTELLIGENCE.—The *Clinical Journal*, founded in 1892 with the object of specially reporting and publishing clinical lectures given by leading physicians and surgeons of the day, has now resumed its weekly appearance. Messrs. H. K. Lewis and Co. are now responsible for publication and propose to include in it short notices of books likely to interest the general practitioner. The subscription price of the journal is 28*s*. 6*d*. a year, post free.

THE LATE DR. HENRY SHACKLETON. — Dr. Shackleton died at Sydenham, at the age of 73, on August 26th. Born at Moone, co. Kildare, in 1847, he only took up medicine comparatively late in life, and qualified M.D. Dub., M.R.C.S. Eng., and L.M.K.Q.C.P. Irel. in 1884. He practised at Sydenham for over 30 years, retiring about four years ago. Dr. Shackleton was the father of the distinguished explorer.

MEDICAL SICKNESS, ANNUITY, AND LIFE ASSURANCE SOCIETY, LTD.—The first general meeting of this society took place on August 23rd, three months after the conversion of the friendly society into a company. The chairman expressed regret at having to call a meeting of the members during the holiday season, but according to the memorandum of the company, it is necessary to hold a meeting at the end of three months after the incorporation. The conversion had been carried through quite smoothly. Only 21 members of the old society declined to become members of the company, and most of these were bordering on the age of 65, and therefore just about to sever their connexion with the society. Since conversion considerable progress had been made in all departments. The life assurance business had moved forward with a considerable boom, and in two and a half months proposals had been received for over £10,000. The sickness insurance had also considerably increased, proposals being received for 390 guineas. Dr. J. B. Ball, who acted as medical examiner for the society for a number of years, decided, on conversion, to resign his office owing to his advancing years. Dr. David Forsyth had been appointed as his successor. He was one of the original directors, but resigned on his appointment as medical examiner.

DOCTORS THREATENED AT CORK PRISON.—According to the Belfast *News Letter*, a threatening letter was received by the two medical officers sent by the Government to Cork prison for medical attendance on 11 prisoners hunger-striking there. The officers were Dr. C. J. MacCormack, a medical member of the General Prisons Board, and Dr. J. I. Kinsella, medical officer to the convict prison at Maryborough. The letter was signed C. Cork Brigade, I.R.A., and ran as follows:—

> This is to notify you that we hold you responsible for the lives of the men at present on hunger-strike in Cork jail, and should any of them die there in jail, or after release, you will be guilty of death under the laws of the Republic. If you disclaim responsibility for the present treatment of these men, you can make this fact public by sending a notice of your resignation to the press to-night. This is the only action that will save you should a single prisoner under your charge die.

The Dublin Castle authorities gave it clearly to be understood that the two medical men went to Cork Prison under orders from the Government, and that as soon as they had examined the prisoners thus placed under their medical care they strongly recommended to the Government that on medical grounds the prisoners should be released. The statement concludes: "The responsibility of Dr. MacCormack and Dr. Kinsella is confined to taking such steps as are within their competence as medical men to relieve the condition to which the prisoners have been reduced by their own act."

RABIES IN WILTSHIRE.—In consequence of the occurrence of several cases of rabies in the neighbourhood a "dangerous" area has been proclaimed having a radius of about five miles round Salisbury and Wilton. A larger area with muzzling restrictions includes parts of Wilts, Hants, Dorset, and Berks.

SMALL-POX IN SCOTLAND.—474 cases of small-pox have been reported to date in the Glasgow district and the outbreak is becoming more evenly distributed throughout the city. Vaccination is stated to be falling off. Two cases were reported in Edinburgh last week-end.

CLOSING OF WHARNCLIFFE WAR HOSPITAL.—After more than five years' service as a military hospital under Lieutenant-Colonel W. J. N. Vincent, the South Yorkshire Asylum at Wadsley has been demobilised and reverts once more to its original duties as an asylum. One large block of buildings, however, remains a hospital for pensioners, and it is intended that all the sick pensioners in the district shall be treated there. This arrangement sets free the two wards at the Royal Hospital, which have for some months been used for pensioners in connexion with the Orthopædic Fund Committee. A large number of men still receive medico-mechanical treatment at the Edgar Allen Institute, which, under the direction of Dr. R. G. Abercrombie, has proved of great value in this work during and since the war.

ROYAL HANTS COUNTY HOSPITAL, WINCHESTER.—A special appeal is being made throughout Hampshire on behalf of the County Hospital, Winchester, to obtain a sum of £6000 to pay off the overdraft due to the bankers. Sir Shadforth Watts has promised a contribution of £1000 provided the whole of the debt is paid off. The committee has resolved that the work of the hospital in future must be so conducted as to make the expenditure conform to the revenue. To carry out this policy one ward has been closed, and a scheme is being formulated with the assistance of the trade-unions whereby every wage-earner, man and woman, will be urged to contribute a small weekly sum to the hospital. In-patients are asked to contribute towards the cost of their food as far as their means permit.

Obituary.

PHILIP JOHN HENSLEY, M.D. CAMB. & DURH., F.R.C.P.,

CONSULTING PHYSICIAN TO ST. BARTHOLOMEW'S HOSPITAL.

Dr. Hensley, who died at Shortheath, Farnham, on August 8th, was in his eighty-second year, and had lived long in retirement. He came up to London with a brilliant record from Christ's College, Cambridge, where he passed high as a wrangler. After qualifying M.B. Camb. in 1867 he early reached the position of house physician to St. Bartholomew's Hospital, and began to demonstrate physics in the medical school. He was a careful and minute observer, and an early contribution to the *Hospital Reports* was a mathematical demonstration of the exactitude of Sir William Roberts's yeast process for determining the amount of sugar in the urine. The same traits followed him into the out-patient department and the wards of the hospital, where his exact teaching was attractive to his clinical clerks. His lectures on forensic medicine contained sound substance and interesting detail, but were rendered unacceptable to students by an unfortunate defect of elocution. Hensley was no specialist in the narrow sense, but his knowledge of pulmonary diseases was such that cases from his clinic which led to an autopsy amply supported his diagnosis. At this time he was also physician to the Royal Hospital for Diseases of the Chest. Elected F.R.C.P. in 1871, Hensley was Goulstonian lecturer in the following year; he became Councillor in 1895, and Censor for the two years 1898–99. At the time of his death there were only five Fellows senior to him. In person Dr. Hensley was singularly modest and self-effacing, and of even temper. He married rather late in life a devoted wife, an accomplished painter in water-colours, and thus had to relinquish his Fellowship at Christ's College. He had no family, and his wife predeceased him. He retired from London after a full service at the hospital, taking with him the esteem of his colleagues, and much missed by all who understood his worth and appreciated his powerful intellect and sweetness of character.

Medical Diary.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

WEST LONDON POST-GRADUATE COLLEGE, West London Hospital, Hammersmith, W.

MONDAY, Sept. 6th.—2 P.M., Dr. G. Stewart: Medical Out-patients. 2 P.M., Mr. D. Armour: Operations.
TUESDAY.—2 P.M., Dr. Burnford: Medical Out-patients. 2.30 P.M., Mr. Addison: Visit to Surgical Wards.
WEDNESDAY.—10 A.M., Dr. A. Saunders: Medical Diseases of Children. 2 P.M., Mr. Gibb: Eye Department.
THURSDAY.—2 P.M., Mr. D. Armour: Operations. 2 P.M., Mr. Sinclair: Orthopædic Department.
FRIDAY.—10 A.M., Mr. D. Buxton: Dental Department. 2 P.M., Mr. Banks Davis: Diseases of the Throat, Nose, and Ear.
SATURDAY.—10 A.M., Dr. A. Saunders: Medical Diseases of Children. 2 P.M., Dr. Owen: Medical Out-patients.
Daily:—10 A.M., Ward Visits. 2 P.M., In-patient, Out-patient Clinics and Operations.

MALE LOCK HOSPITAL, Dean-street, W.

MONDAY, Sept. 6th, WEDNESDAY, AND FRIDAY.—5 P.M., Dr. C. Russ: Demonstration of the Treatment of Gonorrhœa by Electrolysis.

Appointments.

Successful applicants for vacancies, Secretaries of Public Institutions, and others possessing information suitable for this column, are invited to forward to THE LANCET *Office, directed to the Sub-Editor, not later than 9 o'clock on the Thursday morning of each week, such information for gratuitous publication.*

JOLL, CECIL A., M.S., M.B., B.Sc. Lond., has been appointed Surgeon to the Royall Free Hospital, and Consulting Surgeon to Royal Bucks Hospital, Aylesbury.

MULLALLY, G. T., M.C., M.S., F.R.C.S., Assistant Surgeon to the Westminster Hospital.

Certifying Surgeons under the Factory and Workshop Acts: WALKER, A. (Cardenden); WALLS, J. A., M.B., Ch.B. Glasg. (Bothwell); GILES, A. C., M.B., Ch.B. Edin. (Sleaford); BLAKE, V. H., M.B., B.S. Lond. (Great Yarmouth).

Vacancies.

For further information refer to the advertisement columns.

Barnsley, Beckett Hospital and Dispensary.—Sen. H.S. £250.
Battersea General Hospital (incorporated), Battersea Park, S.W.—Third Res. M.O. £200.
Bedford County Hospital.—Asst. H.S. £150.
Belgrave Hospital for Children, 1, Clapham-road, S.W.—Asst. P. 50 gs. Also Female H.S. £100.
Bengal, University of Dacca.—Chair of Physical Education. Rs. 9000 to Rs. 12,000.
Birmingham City, Salterley Grange Sanatorium for Consumptives.—Res. M.O. £550.
Birmingham General Hospital.—Surg. Registrar. £200.
Bootle County Borough.—Tubere. O. and Dep. M.O.H. £750.
Bradford Royal Infirmary.—H.S. £200.
British Guiana.—Asst. M.O.H. £600.
Bristol General Hospital.—Two H.P.'s, H.S., and Obstet. O. and H.S. £175 each.
Cancer Hospital, Fulham-road, S.W.—Asst. P. and Med. Reg. £250. Also Two H.S.'s. £150.
Cardiff, King Edward VII. Welsh National Memorial Association.—Asst. Tubere. P.'s, £500.
Central London Throat and Ear Hospital, Gray's Inn-road, W.C.—Registrar.
Chester County Asylum.—Third Asst. M.O. £350.
Chester Royal Infirmary.—H.S. £200. Also H.P. £175.
City of London Hospital for Diseases of the Chest, Victoria Park, E.—H.P. £100.
Colonial Service.—M.O.'s for West African Medical Staff, Government Service in Malaya, East African Protectorates, West Indies (including British Guiana), Fiji, and the Western Pacific, &c.
Devonport, Royal Albert Hospital.—H.S. £200.
Durham County Council.—Female Asst. Welfare M.O. £600.
Durham University, College of Medicine, Newcastle-upon-Tyne.—Lecturer on Med. Jurisprudence.
East Africa.—M.O. to C.M.S., Kavirondo.
Edinburgh Royal Infirmary.—Asst. Path., Asst. Clin. Path. £500 each. Also Second Asst. Clin. Path. £350.
Exeter, Royal Devon and Exeter Hospital.—Surg. Reg. Asst. M.O. in Electrical Treatment Dept.
Great Northern Central Hospital, Holloway-road, N.—H.P. £150.
Huddersfield Royal Infirmary.—Asst. H.S. £150.
Hull and Sculcoates Dispensary.—M.O. £500.
Hull Royal Infirmary.—Asst. H.S. £150.
Ingham Infirmary and South Shields and Westoe Dispensary.—Jun. H.S. £175.
Kensington Board of Guardians.—Fourth Asst. M.O. £250.
Kent Education Committee.—Sch. Med. Inspec. £562.
Liverpool Dispensaries.—S. £300.
London Lock Hospital, Soho, W.—Hon. S.
London Temperance Hospital, Hampstead-road, N.W.—H.P. £120.
Maidstone, Kent County Mental Hospital.—Jun. Asst. M.O. £300.
Manchester, Ancoats Hospital.—Anæsth. 10s. 6d. per attendance Also Res. Surg. O. £250.
Manchester Royal Eye Hospital.—H.S. £120.
Manchester Royal Infirmary, Barnes Convalescent Hospital, Cheadle.—Res. M.O. £300.
Manchester Royal Infirmary, Central Branch, Roby-street.—Res. M.O. £250.
Manchester and Salford Hospital for Skin Diseases.—H.S. £100.
Margate, Royal Sea Bathing Hospital.—Res. S. £200.
M.A.B., Colindale Hospital, Hendon, N.W.—Sen. Asst. M.O. £645 5s. Also Jun. Asst. M.O. £515 6s.
Metropolitan Hospital, Kingsland-road, E.—Cas. O. and Res. Anæsth. £120. Also Asst. H.S. and Asst. H.P. £100 each.
Middlesex County Council, Harefield Sanatorium.—Res. Med. Supt. £700.
Ministry of Health.—Asst. Bacteriologist. £300.
Ministry of Health, Welsh Board of Health.—M.O.'s. £600.
National Hospital for the Paralysed and Epileptic, Queen-square, Bloomsbury, W.C.—Registrar. £200. Also Sen. H.P. £150.
Newport, Mon., Education Committee.—Female Asst. Sch. M.O. and Med. Inspec. of Sch. £500.
Nottingham.—Asst. to City Pathologist. £500.
Preston and County of Lancaster Royal Infirmary.—H.S. and H.P. £180 each.
Reading, Royal Berkshire Hospital.—H.P. and Second H.S. £200 each.
Royal Chest Hospital, City-road, E.C.—Asst. M.O. £450.
Scarborough Hospital and Dispensary.—Two H.S.'s. £150.
Scottish Board of Health.—Dist. M.O.'s. £1000.
Sheffield Royal Hospital.—Asst. Cas. O. £150.
Sheffield Royal Infirmary.—H.P. and H.S. for Ear, Nose and Throat. £150 each.
Sheffield University, Department of Pathology and Bacteriology.—Director. £800. Asst. Director. £500. Curator of Path. Museum. £600.
South London Hospital for Women, South Side, Clapham Common, S.W.—Female Asst. S. Also Clin. Assts.
Stafford, Staffordshire General Infirmary.—H.P. £200.
St. Mary's Hospital, Paddington, W.—Med. Supt. £350.
Sudan Medical Department.—M.O. £840.
Sunderland Royal Infirmary.—Jun. H.S. £200.
Taunton and Somerset Hospital.—Jun. H.S. £150.
Uganda.—M.O. to C.M.S. Mengo Medical School.
Union Mental Hospital Service, South Africa.—Jun. Asst. P.'s. £400.
University of London.—Prof. of Med. and Director of Med. Clin. £2000.
Ventnor, Isle of Wight, Royal National Hospital for Consumption and Diseases of the Chest.—Asst. Res. M.O. £300.
Westmorland Sanatorium and Home, Meathop, Grange-over-Sands.—Res. Asst. M.O. to the Westmorland Sanatorium and Asst. Tuberc. O. for Westmorland. £350.
Wolverhampton and Staffordshire General Hospital.—Res. M.O. £200.

The Chief Inspector of Factories, Home Office, S.W., gives notice of vacancies for Certifying Surgeons under the Factory and Workshop Acts at Strabane, Dingwall (Ross), and Poole (Dorset).

Births, Marriages, and Deaths.

BIRTHS.

DRESING.—On August 26th, the wife of Captain H. G. Dresing, *M.C.*, R.A.M.C., of a son.
HARTRIDGE.—On August 24th, at Millington Lodge, Millington-road, Cambridge, to Dr. and Mrs. Hartridge—a son.
NICKERSON.—On August 22nd, at a nursing home, Salisbury, the wife of Colonel W. H. S. Nickerson, V.C., C.B., C.M.G., R.A.M.C., of a daughter.
SMITH.—On August 18th, at Larkhall-rise, Clapham, S.W., the wife of Alex. A. Smith, L.D.S. Eng. of a son.
SPARROW.—On August 29th, at Wayside, Watford, the wife of E. C. Sparrow, M.A., M.B., B.C., of a daughter.
WARREN.—On August 10th, the wife of Surgeon Commander L. Warren, O.B.E., R.N., of a daughter.

MARRIAGES.

DAY—HUGHES.—On August 26th, at St. Clement's Church, Sandwich, Kent, by the Rev. O. Bruce Payne, Vicar, assisted by the Rev. B. W. Day, father of the bridegroom, Harold B. Day, *M.C.*, M.D., F.R.C.P., of Cairo, Egypt, to Winifred Blanche West, second daughter of Mr. and Mrs. W. J. Hughes, of Strand House, Sandwich.
GORDON-TAYLOR—PEGRUME.—On July 24th, at All Souls, Langham-place, Gordon Gordon-Taylor, O.B.E., M.A. Aberd., M.S., M.B., B.Sc. Lond., F.R.C.S., to Florence Mary, eldest daughter of John Pegrume, of Waltham Abbey, Essex.
HORT—THOMPSON.—On August 17th, at Distington Parish Church, Cumberland, Frederick Aylmer Hort, M.A., M.D., B.Sc., L.R.C.P., M.R.C.S., to Muriel Mary, eldest daughter of the Rev. George and Mrs. Thompson.
MAHONY—BURNS.—On August 25th, at the Church of the Holy Name, Manchester, by the Rev. B. Butler, S.J., Martin James Mahony, L.R.C.P. & S. Edin., L.R.F.P.S. Glasg., to Elizabeth, daughter of Mr. and Mrs. Thomas Burns, Rochdale.
MEARNS—GOODRICH.—On August 18th, at All Saints Church, Child's Hill, Captain Alexander Mearns, R.A.M.C., to Gladys Audrey, elder daughter of Mr. and Mrs. Cavendish Goodrich, Ilfracombe.

DEATHS.

HUNT.—On August 26th, at Chagford, Albert W. Dunning Hunt, M.R.C.S., L.R.C.P. Lond., in his 45th year.
SHACKLETON.—On August 26th, at Longton-grove, Sydenham, Henry Shackleton, M.D., Trin. Coll. Dublin, in his 74th year.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.

Notes, Short Comments, and Answers to Correspondents.

SEXUAL MATURITY AND SENILITY: RECENT EXPERIMENTAL STUDY.

SENILITY, according to Dr. E. Steinach—sometime professor of physiology in the German University at Prague and now in Vienna—is occasioned through lack of the hormone secreted by Leydig's cells. His book, "Verjüngung," recently published by Julius Springer in Berlin, describes the various steps which have led to successful rejuvenation. Marshall and Jolly originated this research in 1908, when they showed that a transplanted ovary is capable of maintaining the sexual characters of the individual. About the same date, Steinach observed that autoplastic transplantation of the testes in a juvenile rat produced normal development of the vesiculæ seminales, prostate, and penis, but that the hormone concerned arose, not from the generative cells, but from the interstitial cells described by Leydig. These experiments disposed of the theory that the effect of the testes is to be explained by Ehrlich's side-chain theory. In the female rat, as well as in the male, sexual characters are found to be dependent on the interstitial cell hormone. Experimenting with castrated infantile rats, Steinach observed that the transplantation of normal testes brought about reproduction of the interstitial cells, but degeneration of the spermatocytes. The animal thus treated also displayed an accentuated libido and potency, together with a hyperdevelopment of the secondary sexual characters. The intimate relation between the interstitial cells and sexual development was further emphasised by the fact that such development could be controlled by the operative addition or removal of grafted tissue. The conclusions drawn from the histological sections will require confirmation for, as B. Romeis has pointed out in the current number (August 27th) of the *Münch. med. Wochenschr.*, the staining method employed by Steiner was not adapted clearly to distinguish between interstitial fibrosis and interstitial glandular hyperplasia.

Reinvenation of Senile Rats.

Owing to the close resemblance between the undeveloped condition of the secondary sexual characters in the animal whose hormone-producing tissue had been artificially reduced, and the condition in the senile animal, Steinach was led to believe that the latter also could be brought under control. He therefore endeavoured to restore vigour and potency to senile rats in the same way as he had restored them to castrated juvenile individuals. He selected rats for the purpose of these experiments as they rapidly develop senile symptoms—the average lifetime being two years—and also the difference in appearance and behaviour between young and old individuals is so marked that any alteration is easily discernible. Steinach claims almost invariable success as a result of his operative methods, which consisted of ligature of the vas deferens or coni vasculosi between the testes and epididymis. Rats that had previously shown every symptom of senility, such as total loss of potency and sexual interest, inactivity, lousy condition, baldness, &c., within two weeks were completely rejuvenated. They became active and clean; the hair reappeared; the media of the eye regained their youthful transparency. Sexual interest and potency were restored, frequently to a hypernormal degree. A brief summary of his notes on one of the experiments will bring out these points more forcibly:—

Male rat, aged 27 months; no sexual potency and every sign of senility; operated on 2/3/14. Ligature of coni vasculosi between testes and epididymis on both sides. Hypernormal sexual activity and potency 20/3/14. Gain in weight and appetite; very active, inquisitive, and courageous 30/3/14.

In the case of females, by transplanting the ovaries of a four months' old individual into a senile individual of the same sex, he produced a complete change in the appearance of the subject. The degenerated mammary glands reappeared, and the animals gave birth to healthy offspring.

Application to Man.

Steinach was so encouraged by the success of his experiments on rats that he determined to apply the same methods to men. For advanced cases of male senility he recommends a simple ligature of the vas deferens, while in the case of those suffering from premature senility he has obtained results that were very satisfactory by ligature of the coni vasculosi. These operations have been performed by Dr. Lichtenstern, under the direction of Steinach. Several cases are described in Steinach's book, but it will be sufficient to quote one here.

A man, 71 years old, suffering from breathlessness, trembling, weakness of the heart, feeble mentality, and impotence was obliged to have his left testicle removed on account of an abscess. At the same time the ligature of the vas deferens to the right testicle was carried out. Within a few months after the operation the man was muscularly and organically strong. He grew fresh hair and beard, and his face assumed a youthful appearance. Sexual interest and potency were restored to a marked degree.

In passing it may be remarked that no such rejuvenation has been recorded in this country in the many cases in which the vasa have been tied in old men for prostatic hypertrophy. The operator in fact rather had in view the abolition of sexual vigour. Although in the case of female rats Steinach produced rejuvenescence through the transplantation of the ovaries of a young individual, this method has not as yet been applied to women owing to lack of opportunity. Steinach believes that it would prove successful if tried. Further research into the rejuvenescence of women will, he thinks, develop the use of X rays, which have been successfully employed to stimulate the reproduction of the interstitial cells in animals.

Experimental Masculinisation and Feminisation.

There is ample experimental and other evidence to show that in the vertebrata the internal secretions of the generative glands are factors and perhaps the chief factors in determining the development of the visible secondary sexual characters, and that the factors act independently of the normal generative functions of the glands. The source of the internal secretion or secretions of the ovary is not so definitely proved to lie in the interstitial cells as is that of the testis. The effects of removal of both organs are well known, and so are some of the effects of grafting of these organs. Steinach, however, between 1911–13 added considerably to our knowledge by his experiments on the transformation of the sexual characters in mammals by exchanging the sexual glands. Homological transplantations are conducted between individuals of the same sex and heterological between individuals of different sex—so-called "experiments on transformation." Steinach showed—and this has been confirmed by other observers—that preliminary castration of the experimental animal is absolutely essential for the ingrafting of the heterological gonads, for if there be no previous castration the graft perishes. Whether this is due to an antagonism between the sexual hormones as maintained by Steinach or to an immunity of the non-castrated organism from the hormones of the heterological sexual organs as more recently suggested by K. Sand need not here be discussed, but the striking physical and psychical effects resulting from the grafts are remarkable. Steinach castrated young guinea-pigs and rats, and grafted at the same time ovaries from the same species, either under the peritoneum "in pockets" or subcutaneously. The grafts took root, healed, grew, and became fully functional in the body of the male; the primordial follicles developed to large follicles with normal ova and some reached maturity, burst, and formed corpora lutea with typical lutein cells. The interstitial cells of the ovary also showed a tendency to increase. The implant had all the essential characters of a functional ovary, though it did not attain the same size as in the normal animal. The graft had no accelerating influence on the growth of the true male characteristics—the penis, prostate, and vesiculæ seminales remained infantile just as they do in early castrated males. If, however, the uterus and Fallopian tube were ingrafted with the ovary they were stimulated to growth and development. Specially noteworthy were the effects on the mammary gland—nipple, areola, and glandular tissue—their growth was greatly accelerated and this became as large as the corresponding parts in a normal female of eight to ten months. The influence of the transplanted ovary also affected the growth, proportions, and form of the body and skeleton, and the animal assumed the general characters of a female. Even the hair and fatty deposits corresponded to the female type.

The most prominent change, however, was that of the psychical sexual characters. The animals did not behave with indifference towards normal males as do castrated males, but showed marked sexual instincts and were treated as females. The necessary hormones, probably derived from the thecal tissue and corpus luteum, produced typical female somatic and psychical changes in the male—i.e., what has been called "feminisation." Similarly by grafting testes on castrated young guinea-pigs or rats—i.e., heterological transplantations—"masculinisation" may be produced. The clitoris in the rat becomes greatly hypertrophied. Lipschütz described in one of Steinach's masculinised guinea-pigs hypertrophy of the clitoris, two corpora cavernosa, and also the quill-shaped growths of the male, so that this penis-like organ represented a totally hypospadiacal penis.

Production of Animal Hermaphrodites.

In 1916 Steinach by ingrafting at the same time both kinds of sexual glands on the same infantile castrated male succeeded in producing a hermaphrodite animal. The experimental animal showed a development of homological and heterological characters, both somatic and psychical, an

and, what is more remarkable, the psychic characters became periodically either male or female. K. Sand has more recently confirmed these observations and improved the technique. A testis and an ovary may be simultaneously transplanted into an infantile mammal. The ovary may even be placed in the middle of the grafted testis, forming an ovario-testis when the ovary grows and forms corpora lutea and the testis flourishes. It is thus possible to produce an artificial hermaphrodite both somatically and psychically. These remarkable results may be commended to the consideration of those who have read the attractive lecture by Sir F. W. Mott on "Body and Mind," published in THE LANCET of August 21st, 1920, in which he discusses the Freudian school of psychologists who "assert that all psychic energy has its roots in sexual instinct, and maintain that the sexual life of the individual begins its development at birth or even before birth."

SANITARY CONDITION OF THEATRES AND MUSIC-HALLS.

THE unsatisfactory sanitary conditions in those parts of theatres and music-halls to which the public are not admitted have long been the subject of legitimate complaint by artistes and staff. Not only is there want of proper lavatory accommodation, insufficient ventilation, and dirt in dressing-rooms, but the complaints received by the Ministry of Health have included instances of defective structural conditions and inadequate precautions against fire. The sanitary conditions in many theatres and music-halls are represented as so unsatisfactory as to endanger the health of persons employed in the performances. The Ministry has issued a circular to local authorities suggesting that all theatres, music-halls, and other places of public entertainment should be visited periodically by inspectors of nuisances, who should report both to their authority and to the licensing authority any cases in which the conditions are found to be unsatisfactory. The coöperation of the Secretary of State has been enlisted and licensing authorities are being asked to require a certificate from the inspector of nuisances that the condition of the building is satisfactory in sanitary and other respects before the granting or renewal of a licence. This combined action should lead to a prompt amelioration of conditions which have long been a reproach to the business side of drama.

BROUGHT TO THE BOIL.

THE following incident, which happened at the Great Northern Central Hospital, is given in the first number of *Progress* (price 3*d*.) as an instance of the need for hygienic education in the neighbourhood served by the hospital:—

> A young mother recently brought her baby to the hospital, and the medical officer on examination found that the child was suffering from convulsions. He prescribed the necessary treatment, and the mother inquired as to what procedure she should adopt in the event of the child suffering from a similar attack. The doctor advised her to put the baby into a bath of warm water. A few weeks later the mother again brought her child to the hospital, and the doctor, on a further examination, discovered signs of the infant having been burned. He inquired of the parent the cause of the injury, when she stated that upon the child receiving a further attack, and she not having any warm water available at the moment, placed the baby in a bath of cold water, which she placed upon the fire in order to bring the water to the necessary temperature.

The hospital is enrolling a corps of collectors and using this little journal as a method of propaganda.

THE CORROSIVE CONTENTS OF A GOLF-BALL.

AN inquest was held at Blackburn on August 19th on a young girl who had picked up a golf-ball, and who died after swallowing some liquid which she had obtained when stripping off its coverings with her teeth. The analysis showed that the core of the golf-ball was a liquid contained in a small rubber pouch with a tubular opening tied with a piece of rubber tape. Most of the liquid had leaked out, but what remained was strongly alkaline in reaction and its basic principle was silicate of soda. A jelly-like mixture of the same appeared to form the core of the ball, and in biting the covering the girl probably swallowed some of the corrosive contents, which caused acute alimentary inflammation, ulceration, and subsequent death.

In THE LANCET of July 18th, 1914, we recorded the case of serious injury done to the eye of a golfer through the inner core bursting on his making an inquisitive examination of the construction of the ball. A companion ball at the time was examined in THE LANCET Laboratory, and the inner rubber pouch was found to contain a fluid of high density, which proved on analysis to be a strongly alkaline fluid, consisting mainly of potash soap. We concluded our note by the following sentence: "For the sake of children who may get possession of old golf balls we think that it should be widely known that to experiment with the structure of certain varieties is attended with grave risks." The incident recorded is a regrettable case in point.

DISCONCERTING ACCURACY.

A MEDICAL man examining a new deaf patient asked as a preliminary question, "Is it your right or your left ear that is troubling you?" and received as a reply, "It is my middle ear."

THE LITERARY YEAR BOOK.

To the Editor of THE LANCET.

SIR,—It is intended to make this work an absolutely reliable reference book. Would you kindly permit me, therefore, through your columns, to request authors who have not hitherto sent to the editor of this book details of their works to do so as soon as possible? In all cases a proof will be sent for personal correction, and it is requested that communications should reach me before Sept. 30th.

I am, Sir, yours faithfully,

MARK MEREDITH,
Editor.

67, Dale-street, Liverpool, August 17th, 1920.

Communications, Letters, &c., to the Editor have been received from—

A.—Mrs. V. B. Alvarez, New York; Adelaide Hospital, Dublin, Registrar of; Assurance Medical Society, Lond.; American College of Surgeons, Chicago, Secretary-General of; Messrs. P. Allen and Co., Lond.; Dr. S. G. Askey, Lond.; Dr. A. C. Alport, Moniaive.

B.—Dr. J. Blomfield, Lond; Dr. C. H. Bond, Lond.; British Dental Association, Lond., Sec. of; Blackman Export Co., Lond.; Dr. W. Brown, Bournemouth; Mr. G. Boykin, Sekondi; Dr. G. S. Buchanan, Lond.; Col. R. J. Blackham, Harlington; Prof. F. E. Beddard, Lond.; Miss W. M. Bird, Beckenham.

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E.—Major J. Ewing; "East of Suez."

F.—Dr. Z. P. Fernandez, Leeds; Prof. J. E. S. Frazer, Sea View.

G.—Dr. E. Goodall, Cardiff; Mr. F. C. Goodall, Lond.; Dr. A. D. Gardner, Wadebridge; General Board of Control, Edinburgh.

H.—Prof. A. J. Hall, Sheffield; Major W. E. Home, R.A.M.C.; Sir W. P. Herringham, Lond.; Mr. H. H. Hayes, Birmingham; Mr. H. T. Hicks, Derby; Dr. G. E. Haslip, Lond.; Mr. E. Horton-Smith, Lond.; Home Office, Lond.

I.—Illuminating Engineering Society, Lond., Hon. Sec. of.

J.—Dr. F. H. Jacob, Nottingham; Dr. H. W. Jones, Liverpool; *Journal of the American Medical Association*, Chicago.

K.—King's College Hospital, Lond.

L.—London (Royal Free Hospital) School of Medicine for Women; Dr. G. C. Low, Lond.; Dr. J. D. Leigh, Sunderland.

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N.—National Alliance of Employers and Employed, Lond., Sec. of; National Safety Council, Chicago; Sir G. Newman, Lond.; *Nursing Times*, Lond., Editor of; National Council of Trained Nurses of Great Britain and Ireland.

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U.—University College Hospital Medical School.

W.—Mr. H. Whitelocke, Oxford; Wellcome Historical Medical Museum, Lond., Curator of; West London Hospital Post-Graduate College, Sec. of; Dr. R. Worth, Lond.; Sir C. Wallace, Lond.; Dr. K. Walker, Lond.; Dr. F. P. Weber, Lond.; Dr. C. Westman, Lond.; Dr. A. Wood, Rugby; Westminster Hospital School of Medicine, Lond.

Communications relating to the editorial business should be addressed exclusively to the Editor of THE LANCET, 423, Strand, London, W.C. 2.